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John C. Stebbins, James R. Brownell, William Trayler

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16. ABSTRACT

Vernal wetlands (pools and swales) of the east side of California's Central San Joaquin Valley are found on the older terraces of rivers draining the Sierra Nevada Mountains. Soils of the terraces are typically San Joaquin and Cometa clays. Vernal pools in this region form on small bodies of Alamo or Hildreth clays. Microreliefs contributing to pool formation include "Mima" mound or "Hogwallow" type and seasonal rivulets or swales, both of which contain depressions that contain seasonal rainfall and runoff.

Pool formation occurs when either a cemented hardpan or accumulation of secondary clay (claypan) are present as subsoil in small depressions or swales. Whether secondary clay or cemented hardpan, neither type of subsoil is absolutely impermeable, rather they are slowly permeable. The amount of permeability an individual pool demonstrates is dependent on the amount of and/or quality of the hardpan or claypan subsoil. This limited permeability prevents the pools and soils from becoming highly saline or alkaline. The resulting vernal pools are typically of the Northern Claypan or Northern Hardpan variety (Holland 44120 & 44110) and are weakly to strongly acidic with low levels of soluble salts. Pool size in the east side of the Central San Joaquin Valley ranges from a few hundred square feet to a few acres, with a "typical" pool a few thousand square feet.

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EFFECTIVE MITIGATION TECHNIQUES

For

CENTRAL VALLEY VERNAL POOLS

Final Report

September 1, 1996

Prepared By:

John C. Stebbins, James R. Brownell, William Trayler
California State University, Fresno
Fresno, CA 93740

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BACKGROUND SUMMARY

The California Department of Transportation, (CalTrans), has provided funding for reasearch to investigate methods of enhancing degraded vernal pools or creating artificial pools inthe eastside of the central San Joaquin Valley. The project was initiated in the spring of 1993 and continued through the summer 1996. This final report provides the pertinent data compiled through three growing seasons. The report also provides conclusions based on the findings and recommendations for future reseach in the specific geographic area.

1.0 INTRODUCTION and OBJECTIVES

1.1 Introduction

Vernal wetlands (pools and swales) of the east side of California's Central San Joaquin Valley are found on the older terraces of rivers draining the Sierra Nevada Mountains. Soils of the terraces are typically San Joaquin and Cometa clays. Vernal pools in this region form on small bodies of Alamo or Hildreth clays. Microreliefs contributing to pool formation include "Mima" mound or "Hogwallow" type and seasonal rivulets or swales, both of which contain depressions that contain seasonal rainfall and runoff.

Pool formation occurs when either a cemented hardpan or accumulation of secondary clay (claypan) are present as subsoil in small depressions or swales. Whether secondary clay or cemented hardpan, neither type of subsoil is absolutely impermeable, rather they are slowly permeable. The amount of permeability an individual pool demonstrates is dependent on the amount of and/or quality of the hardpan or claypan subsoil. This limited permeability prevents the pools and soils from becoming highly saline or alkaline. The resulting vernal pools are typically of the Northern Claypan or Northern Hardpan variety (Holland 44120 & 44110) and are weakly to strongly acidic with low levels of soluble salts. Pool size in the east side of the Central San Joaquin Valley ranges from a few hundred square feet to a few acres, with a "typical" pool a few thousand square feet.

Soil properties and microrelief coupled with the Mediterranean climate of the San Joaquin Valley produce pools that are filled primarily by fall and winter precipitation. The pools dry during mid to late spring and remain dry throughout summer and early to mid fall. Timing and amounts of rainfall result in a great deal of variability in both duration of and amount of standing water in a pool. During drought years many pool sites may not fill or may contain only a small amount of water which disappears within a week or two. Conversely, during seasons of heavy rains pools that typically exist as isolated units may be connected to proximal pools creating a larger "super pool" that holds water for months.

The variable and often ephemeral conditions of vernal pools present many challenges to the biota that occupy the pools. Many of the vascular plants, invertebrate and vertebrate animals of the pools are adapted specifically to the often harsh, cyclical, conditions of vernal pools and are not found in other habitats. During some years proper conditions for successful reproduction are not present for many species. Destruction or severe alteration of a substantial number of Central San Joaquin Valley vernal pools during the last 40-50 years has resulted in severe impacts to vernal pool species. When considering both the reproductive uncertainties and massive habitat destruction, it is not surprising that much of the vernal pool biota is rare or endangered.

Agriculture and urbanization have taken the biggest toll on vernal pools, however, associated road construction has and will continue to impact vernal pools. In some instances a road may create an artificial vernal pool by providing a levee against which water may pool. However, runoff from roads can contain petroleum products and shoulder maintenance may cause herbicide contamination and silting of both natural and created pools. Indirect impacts from road construction include increased opportunities for additional residential land development and/or conversion to agriculture.

1.2 Objectives

Both direct and indirect impacts to vernal pools will result from the expansion and rerouting of California State Highway 41 north of the San Joaquin River in Madera County. To mitigate for these losses or impacts due to this and other projects in the Central San Joaquin Valley, CalTrans (California Department of Transportation) has undertaken a study to develop methods for enhancing existing, degraded vernal pools and or creating artificial pools with characteristics of natural pools in the region.

2.0 PERSONNEL and AGENCIES INVOLVED

2.1 Personnel Involved

The following people were involved in the design and construction of artificial vernal pools and/or the monitoring of both artificial and natural vernal pools: Alisa Durgarian, Greg Kirkpatrick, John Stebbins, Bill Trayler and Russell Kokx, (Biologists, CSU Fresno) Robbin Thorp and Joan Leong (Entomologists UC Davis) Timothy Heyne (Biologist, Cal Dept Fish and Game); James Brownell and Alfredo DaSilva (Soil Scientists CSU Fresno); Robert Epperson and Rudy Chavez (Environmental Planners, CalTrans); Kerry Dawson and Steve Greco (Department of Environmental Design, UC Davis)

2.2 Consultation With Regulatory and Resource Agencies

Consultations with personnel representing the United States Fish and Wildlife Service (USFWS), the United States Bureau of Reclamation (USBR), The Environmental Protection Agency (EPA), the Army Corps of Engineers (ACE), and the California Department of Fish and Game (CDFG) were held to established operating procedures acceptable to those agencies (see Table 1).

Table 1. Professionals consulted during the project.

Name	Position	Agency/Institution/Company
Mr. Mike Aceituno	Wetlands Specialist	US Fish and Wildlife Service
Mr. Brian Apper	Environmental Supervisor	CalTrans
Mr. Tom Cavanaugh	Wetlands Ecologist	US Army Corp Of Engineers
Mr. Tom Coe	Wetlands Ecologist	US Army Corp Of Engineers
Mr. Peter Cross	Endangered Species Biologist	US Fish and Wildlife Service
Ms. June De Weese	Biologist	US Fish and Wildlife Service
Ms. Nancy Duggs	Wetlands Specialist	Environmental Protection Agency

Table 1. Continued.

Dr. Wayne Ferren	Herbarium Botanist	UC Santa Barbara
Mr. Darren Fong	Wetlands Biologist	US Fish and Wildlife Service
Mr. Rod Goss	Plant Ecologist	Calif. Dept. Fish and Game
Mr. Timothy Heyne	Fisheries Biologist	Calif. Dept. Fish and Game
Dr. Howard Latimer	Plant Ecologist Emeritus	CSU Fresno
Ms. Joan Leong	Entomologist	UC Davis
Ms. Wendy Melgin	Biologist	Environmental Protection Agency
Mr. Dale Mitchell	Director Environmental Services Region 4	Calif. Dept of Fish and Game
Mr. Clyde Morris	Environmental Specialist	Environmental Protection Agency
Mr. Mike Mulligan	Environmental Services Region 4	Calif. Dept of Fish and Game
Dr. Joe Pescman	Herpetologist	Savannah River Ecology Lab
Mr. John Reiger	Biologist	CalTrans District 11
Dr. Kristina Schierenbeck	Plant Ecologist	CSU Fresno
Dr. Jeff Single	Environmental Biologist	Calif. Dept. Fish and Game
Dr. Robert Stebbins	Herpetologist	UC Berkeley (emeritus)
Dr. Dean Taylor	Botanist	Biosystems Analysis/Jepson Herbarium
Dr. Robbin Thorp	Entomologist	UC Davis
Dr. John Weiler	Botanist	CSU Fresno (emeritus)
Dr. Dan Williams	Director	U. S. Department of Interior San Joaquin Valley Endangered Species Recovery Project
Ms. Kristi Young	Biologist	US Fish and Wildlife Service
Dr. Paul Zedler	Biologist	CSU San Diego

3.0 POOL CONSTRUCTION, INOCULATION and MODIFICATIONS

3.1 Site Selection and Description

Physical and botanical aspects of numerous natural vernal pools in Madera and Fresno counties were observed and recorded. Features such as depth, slope, overall dimensions and soil type were matched with specific vascular plant species. These data were used as guidelines for constructing vernal pools likely to support both sensitive and more common plant species.

Sites suitable and available for vernal pool construction were extremely limited. Private land owners were contacted but were unwilling to allow construction of wetlands, and government properties possessing the desired soils and physical features were few. The area selected for pool construction is located on United States Bureau of Reclamation property adjacent to the Madera Equalization Reservoir in southeastern Madera County, California. The coordinates are, T.10S, R.19E, S.18&7, Elevation 400 feet, USGS Daulton Quad (See Figure 1). See Figure 2 specific site map.

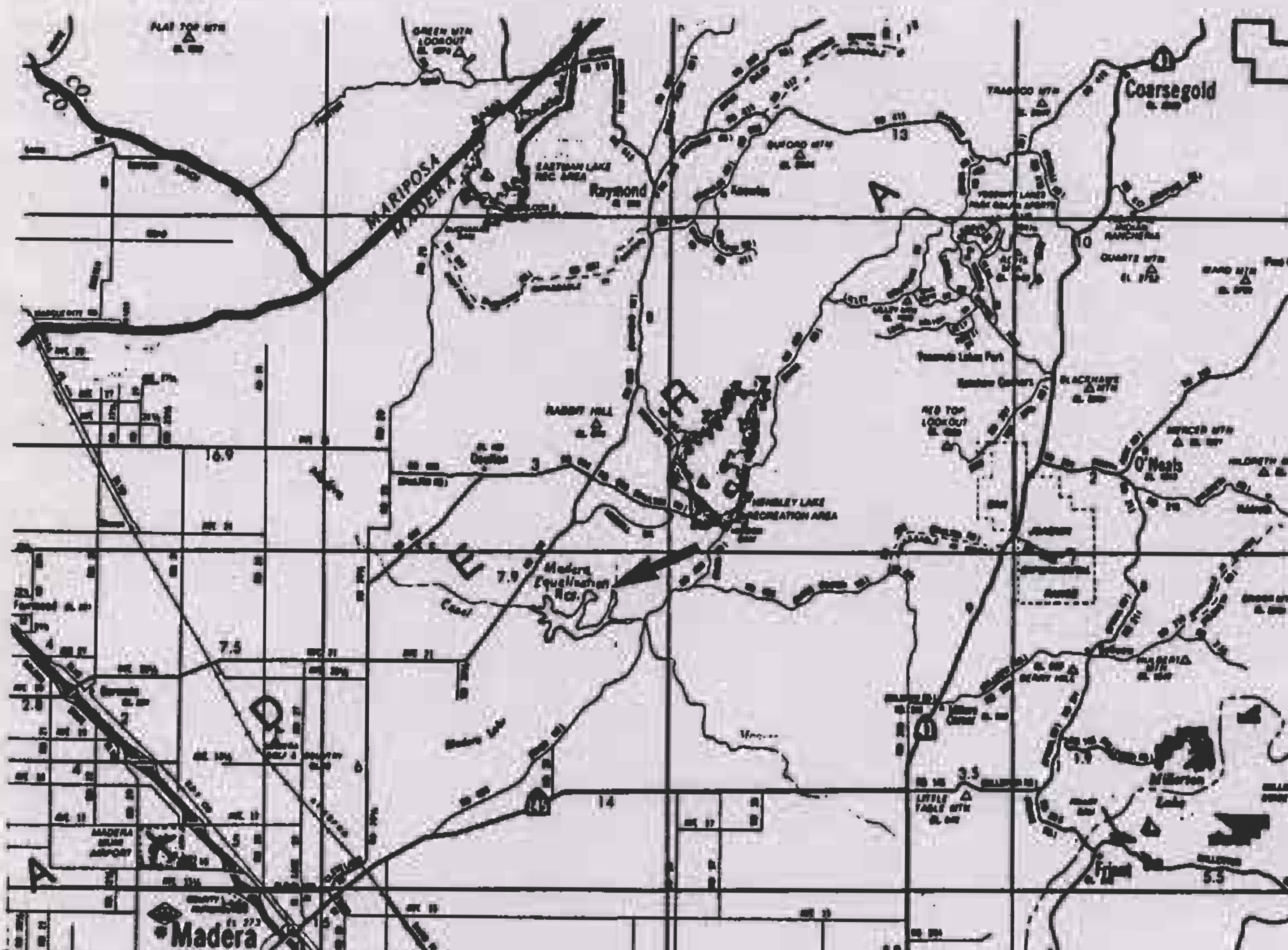

Figure 1. Study site location map.

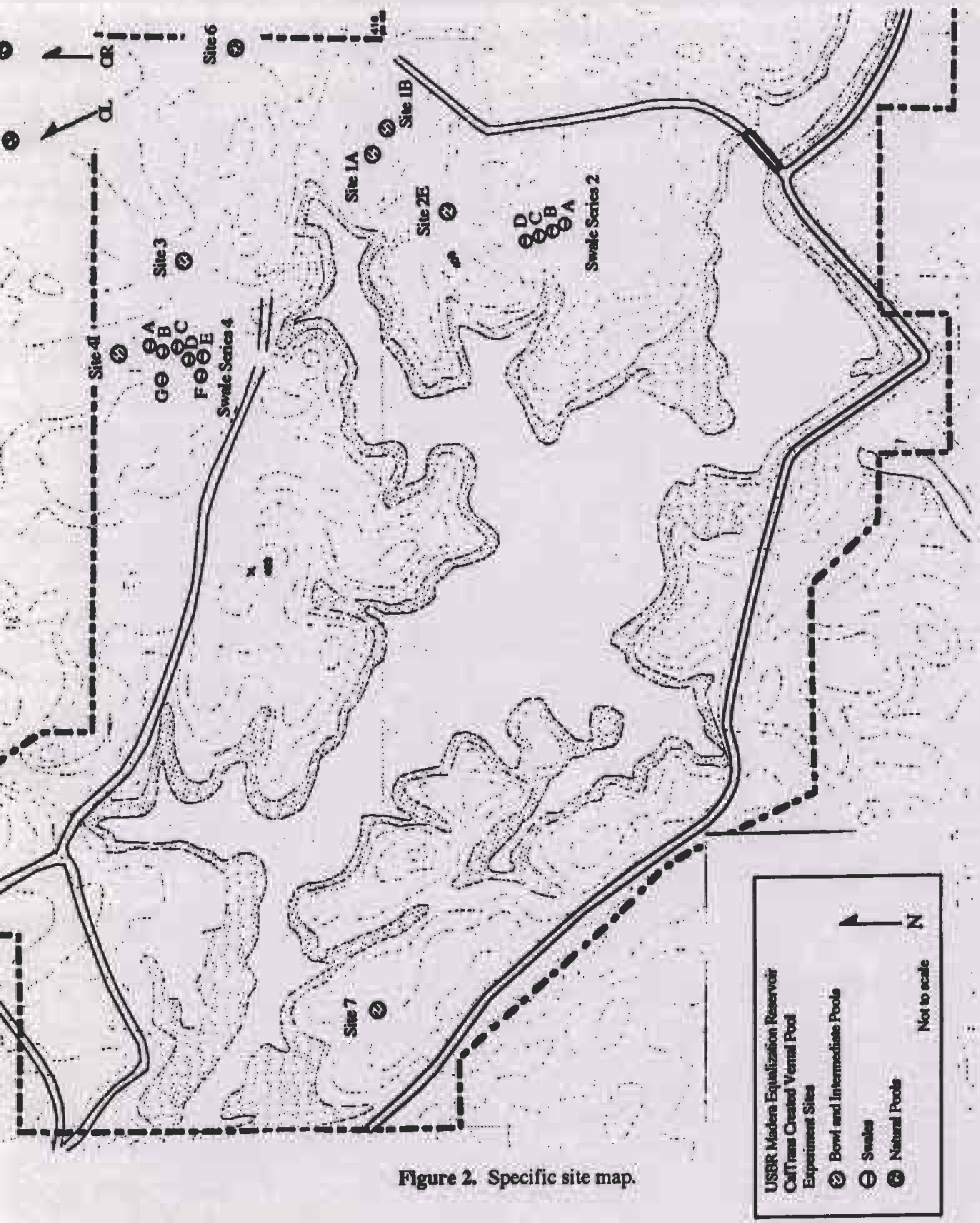

Figure 2. Specific site map.

The topography at the study area is gently rolling hills and swales supporting non-native grassland (Holland 42200). The major soil series of the area are Cometa and Montpellier. The Hildreth and Alamo clays associated with vernal pools in nearby areas were absent at pool construction sites.

Commonly observed plant species included: *Brodiaea elegans, Dichelostemma capitatum, Erodium cicutarium, Erodium botrys, Eschscholzia californica, Holocarpha heermanii, Hordeum murinum* ssp. *leporinum, Lupinus formosus, Trifolium subterranean* and *Trichostema lanceolatum.* Specific sites within the area supported species such as *Juncus bufonius, Hordeum marinum* ssp. *gussoneanum* and *Eryngium vaseyi*, indicating these sites received more or held water for longer periods than other sites within the area.

Within the study area, specific sites were selected based primarily on slope, soil characteristics and vegetation present. The proximity of natural vernal pools was an additional incentive for selecting the study area. Many vernal pool plants are associated with pollen specific bees. It was hoped that the nearby pools might serve as a source of pollinators for created pools and might aid in the incidental establishment of other vernal pool species.

3.2 Pool Construction

Pool construction was performed during September 1993. CalTrans equipment operators used front end loaders to remove topsoil from each pool site. Bentonite clay meeting US Army Corp of Engineers specifications was then mixed with the topsoil in a ratio of approximately 1 part bentonite clay to 10 parts topsoil. Bentonite swells when wetted and forms an barrier, that prevents the rapid percolation of water. Prior testing indicated a higher percentage of bentonite was necessary to induce cracking in dry soil than was needed as a water barrier. *Orcuttia pilosa* and *O. inaequalis*, two rare, endemic, vernal pool grasses have been associated with pronounced surface cracking. Surface cracking has also been observed in vernal pools supporting amphibians, including Western Spadefoot Toads, *Scaphiopus hammondii*, and California Tiger Salamanders, *Ambystoma tigrinum californiense*. Therefore, a higher percentage of bentonite clay was mixed into artificial pools than needed solely for a water barrier. Three created pools sites 2D, 4F and 4G did not receive bentonite. A levee was constructed at the lower end of pool 4G, a small natural depression that may have held some water prior to levee construction.

Each pool site was initially contoured by an equipment operator using a road grader. Specific contouring was based on individual site properties and two basic types of pools were constructed, **swale-like** and **bowl-like**. Created swale-like pools were relatively shallow, 8-12 inches deep, and were constructed so that water collected against a levee and backed up with additional precipitaion. These pools tended to slope in a single direction, toward the levee. Bowl-like pools were deeper, 12-18 inches and as the name implies sloped toward the center of the pool rather than toward a single side. Bowl-like pools had less surface area for their volume than did swale-like pools. Because most water loss is due to evaporation which is limite by the amount of surface area this difference in design cause bowl-like pools to dry more slowly than swale-like pools. A few pools were classified as intermediate pools. These pools were similar to swale-like pools in depth but sloped toward the center as do bowl-like pools (see Table 2 for type designation of specific pools).

Two sites with relatively long, steep slopes were selected and a **swale-like** series of pools was created at each site (see Photograph 1, Appendix A). Each pool within a series was constructed by modifying part of the slope and moving soil to the down slope end creating a levee. In addition to catching rain each pool was designed to receive inflow from drainage and overflow from higher pools.

Sites that were located on short slopes or level areas were contoured to create a basin or **bowl-like pool** (see Photograph 2, Appendix A). Pools at these sites were designed to function strictly as catchment basins and were supplied by a limited drainage area.

Two pools, 1B and 4I were **intermediate** in structure (see Photograph 3, Appendix A). They were primarily bowl-like in structure but their overall depths were closer to swale-like pools than bowl-like pools and they dried out sooner than bowl-like pools.

Table 2. Location of different pool types (see Figure 2, specific site map).

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	7
Bowl	X						X	X									X
Swale			X	X	X	X			X	X	X	X	X	X	X		
Intermediate		X														X	

Upon completion of initial contouring, each pool site had the topsoil/bentonite mix replaced and additional contouring was performed by equipment operators. Final contouring was performed by prison work crews using rakes and shovels under the supervision of CalTrans and CSU Fresno personnel. Each phase of construction was carefully directed by personnel using surveying equipment to insure that depth and other physical features approximated a "typical vernal pool".

3.3 Collection and Distribution of Inocula

Vascular plants growing in and around natural vernal pools within ten miles of the study site, served as seed sources for the artificial pools. Seeds and vegetative material (**inocula**) were collected during the spring and summer of 1993, prior to the construction of artificial pools. A gasoline powered rotary lawn mower with catch bag was used to harvest plants bearing mature seeds. Species such as *Psilocarphus sp*., (which are too short to be collected by the previously mentioned method), were detached with a gasoline powered weed eater, or hand tools, and then collected by hand. No more than 15% of the total surface area or any specific population was mowed or collected. Most of the inocula was collected from highly degraded vernal pools containing only relictual populations of vernal pool species. In addition to plant material, soil samples were collected for use as inocula. The soil may have contained diapause eggs (resting eggs) of invertebrates and/or mycorrhizal fungi associated with vascular plant species. Plant material was stored in burlap bags and soil was stored in paper bags at room temperature until used. Approximately 2 weeks after the completion of pool construction, (early October 1993), inocula was spread by hand and hand raked into the top 2 inches of soil in the created pools . See Table 3 for types and distribution of inocula used.

Table 3. Inocula distribution by species and pool number.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	7
Species																	
Castilleja campestris ssp. succulenta	X																
Downingia bicornuta	X																
Downingia ornatissima	X		X	X	X	X	X	X									
Eleocharis macrostachya								X									
Eryngium vaseyi			X	X	X	X	X	X	X	X	X	X	X	X		X	
Hordeum marinum ssp. gussoneanum	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Juncus bufonius	X	X							X	X	X	X	X	X		X	
Lythrum hyssopifolium			X	X	X	X	X		X	X	X	X	X	X		X	
Marsilea vestita	X	X						X	X	X	X	X	X	X		X	X
Mimulus tricolor								X	X								
Orcuttia inaequalis	X	X	X	X			X										X
Orcuttia pilosa								X	X	X	X	X	X	X		X	X
Pilularia americana																	X
Plagiobothrys stipitatus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	
Psilocarphus brevissimus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
Soil			X	X	X	X	X		X		X	X	X	X		X	X

3.4 Fencing of Pools

Because cattle grazing occurs from approximately November 15 to April 15 most sites were fenced with 3 strands of barbed wire to exclude cattle while allowing wildlife to visit pools at will. Pool 7, a single bowl-like pool was left unfenced and Pool 1A, another bowl-like pool was cross fenced, providing access to the water and to approximately one-half of the vegetation surrounding the pool. Nearby natural pools that were also studied remained unfenced.

4.0 SOIL ANALYSIS and MODIFICATION

4.1 Soil Analysis: Preconstruction 1993

Prior to pool construction several soil texture analyses were performed on a portion of each sample collected from future pool construction sites. The remaining portions of these samples were then mixed with varying amounts of bentonite clay to determine the amount needed to seal the soil and the amount needed to cause cracking of the soil upon drying. The preferred range of bentonite content by percent was subjectively chosen based on the degree of surface cracking of the dried mixture. Cracking is associated with natural pools that support *Orcuttia pilosa* and *O. inaequalis*, two rare, endemic, vernal pool grasses. A higher percentage of bentonite, (approximately 6%) is required to achieve suitable level of cracking than is necessary to create a water barrier (approximately 2%). Therefore a higher percentage of bentonite clay was mixed into artificial pools than needed solely for a water barrier. See Table 1E, Appendix E for results of soil texture after mixing.

4.2 Soil Analysis: Post Construction 1993 -1996

The marine deposited bentonite caused created pools to have higher initial pH values and salinity levels than the natural pools on the nearby Fenston ranch and the native soil at the study area (see Table 2E, Appendix E). However, these values did not appear to exceed critical limits because most vernal pool flora and fauna introduced to the created pools survived and reproduced.

Analysis of pool liner soils after the first wet season (1993-1994) demonstrated a drop in both pH and salinity values (see Table 2E, Appendix E). Two subsequent analyses indicate the average soil conditions have stabilized at these lower values. This apparent loss of soluble salts suggests that some downward movement of water through the bentonite layer occurs just as it occurs through the claypan of natural pools.

5.0 PRECIPITATION, INUNDATION PERIODS and WATER CHEMISTRY

5.1 Precipitation

Precipitation data collected from the Daulton station (approximately 6 miles northwest of pool site) were provided courtesy of the California Department of Water Resources (see Table 1D, Appendix D).

5.2 Pool Structure and Inundation Periods .

Bowl-like and deeper, swale-like pools held water sooner and for longer periods than shallow, swale-like pools (see Tables 2D and 3D, Appendix D). All created pools containing bentonite held water earlier and for longer periods than nearby natural pools during the 1993-94 and 1994-95 seasons. Because investigators were not provided with the USFWS guidelines for vernal pool mitigation and monitoring these data were not collected for the 1995-96 season.

5.3 Water Loss From Pools 1994-1995

Water loss due to evaporation versus percolation was measured and loss was determined to be primarily through evaporation during the 1994-95 season. A short length of 1" diameter PVC pipe was driven into the pool liner, the water level inside the pipe equalized with that outside the pipe, the data recorded and a removable cap placed on the pipe. Measurements were taken inside and outside the pipe on two subsequent weeks. Water loss from inside the capped pipe was due entirely to percolation. Water lost from outside the pipe was due to percolation and evaporation. The difference between the water loss from inside the pipe and water loss outside the pipe represents evaporation. When selected created pools were compared with natural pools the results were similar (see Table 4D, Appendix D).

5.4 Water Chemistry, 1994-95

Water chemistry was measured in three created and two natural pools. Ammonium ion, ammonia, nitrate, orthophosphate and phosphate levels were measured in the field using Hach colormetric water test kits. Electrical conductivity was measured in the laboratory and pH was measured in the field using a portable pH meter. Levels were measured weekly for a three week period beginning March 28, 1995 and ending April 11, 1995. No values appear extreme for any of the pools, however, phosphate levels are somewhat higher in the two natural pools (see Table 5D, Appendix D).

6.0 VEGETATION MONITORING METHODS

6.1 General Guidelines

USFWS guidelines for monitoring created vernal pools were drafted in December 1994, however, researchers involved with this project (which began in September 1993) were not provided with these guidelines until late June 1996. For this reason, not all of the data desired by USFWS was collected and other data not requested was collected. We have attempted to address as many issues contained in USFWS guidelines as possible if data collection methods originally selected for this project allowed. Although we are addressing these issues, this project is not believed to be restricted to the guidelines for the following reasons. First, this project was started before the issuance of such guidelines, and approval for the methods used was obtained from numerous state and federal agencies. Second, the pools created for this project were not constructed for mitigation purposes. These pools were created to evaluate methods for establishing future mitigation vernal pools tailored to the unique conditions found in the eastside of the central San Joaquin Valley.

Several factors including the following made addressing USFWS data analysis guidelines difficult. The vernal pools selected for reference pools were not the pools used as models for constructed pools. Reference pool selection was based on landowner permission to trespass rather than similarity to created pools. None of the constructed pools were as large as two of the reference pools, (OL and OR) and many constructed pools were larger than reference pool 6. There was a great deal of variation in the hydrology and potential depth of constructed pools. As mentioned previously, constructed pools were of three types, bowl-like, swale-like and intermediate type. The reference pools were all of the intermediate type. Furthermore, the reference pools were not the seed source for the created pools and two species of native vernal pool endemics, *Epilobium cleistogamum* and *Castilleja campestris succulenta* naturally occurred in one or more of the reference pools. Only one of these species, *Castilleja campestris succulenta* was used as inocula, and only in a single constructed pool. All pools, whether constructed or reference, were monitored on the same schedule. Due to the differences in hydrology, size and potential depth, data collected on the same day may not lend itself to comparison. Many pools may have been inundated and others almost dry on the same date.

Despite these complicating factors, by addressing USFWS guidelines along with the methods originally enacted, more insight and important data was gained. These data will aid in developing improved monitoring and construction methods for future pool mitigation projects.

Vegetation data were collected along a permanent transect bisecting each pool and passing through the deepest site in each pool. Data were collected from within a 10 cm x 10 cm frame at 20 cm intervals along the transect. Frequency, cover and diversity were calculated from the data. Identifications follow the Jepson Manual (J. Hickman, ed. 1993).

In additon to data collected along the permenant transect, non-quantitative field observations were made. These observations are considered professional judgements and were used to access the vigor and sucess of sensitve plant species and some frequency data.

6.2 Richness

Richness is defined as the number of different species found in a given area. In addition to data collected along the permanent transect, each pool was surveyed in its entirety for other species. Richness data represent all species found in an individual pool for the entire season.

6.3 Diversity

Diversity is a combination of species richness, (i.e.. presence of species), and species evenness, (the relative abundance of species). The Shannon-Weiner index of diversity was calculated for all pools for the 1994-95 and 1995-96 seasons. The formula used was ($H = \Sigma (p_i) (\log_2 p_i)$, where pi is the proportion of individuals of each species and $\log_2$ = log base 2.

6.4 Cover

Cover is a measure of dominance and appears to be the most consistent measure of success of vernal pool plant establishment and reproduction. Cover was expressed by plant species, for each pool. Cover values were determined by first assigning each species located within a 10cm x 10cm frame to one of six coverage classes: 1) 0-5%, 2) 6-25%, 3) 26-50%, 4) 51-75%, 5) 76-95%, 6) 96-100%. The median value of the assigned class was then multiplied by the number of quadrats in which a species was observed thus producing a cover value for each species. Cover data were interpreted as absolute or total vegetative cover, relative cover of native vernal pool plant species and relative soil and vegetative cover.

6.5 Species Frequency

Frequency is the percentage of total quadrats that contain at least one rooted individual of a species. Frequency data were calculated for several dates during the growing period of all three seasons .

6.6 Sensitive Species

Two sensitive plant species, San Joaquin Orcutt grass, (*Orcuttia inaequalis*), and Hairy Orcutt grass, (*Orcuttia pilosa*), were inoculated into several pools. Data were collected along the permanent transect and non-quantitative field observations concerning the populations were made.

7.0 VEGETATION, RESULTS and DISCUSSION

7.1 Factors Influencing Vegetative Success

The establishment and continued reproduction of vegetation is dependent on many biotic and abiotic factors. Abiotic factors include soil fertility, soil chemistry, soil density, the quantity and quality of light, temperature, hydrology, basin characteristics and the amount and timing of precipitation. Biotic factors include pollinators, mycorrhizal associates and predation. Of all these factors, the one having the most immediate affect on vernal pool plants is the amount and timing of precipitation. Simply stated, vernal pool species need more water than plants adapted to drier habitats.

The amount and timing of precipitation for the life of this project was variable from a high of 26.11 inches during the 1994-95 season, a low of 9.8 inches during the 1993-94 season and a moderate 13.72 during the 1995-96 season (see Tables 1D, 2D and 3D, Appendix D). This variation undoubtedly influenced vegetation patterns for each of the individual seasons. Coupled with the relatively short duration of this project, any statements or conclusions, concerning trends, for vegetation are tentative.

Another complicating factor for vegetation analyses performed during the project was the sampling method. As mentioned previously, permanent transects were established in each pool and all cover, frequency and diversity data were collected along these transects. This method resulted in two distinct problems that became more obvious after several sampling seasons. First, the soil and vegetation along the transect was disturbed despite efforts to minimize such events.

Secondly, the morphology and hydrology and of many of the pools along with vegetation patterns, may have limited the efficacy of the sampling method. Natural vernal pools are well known for the zonation or ringing of specific plant species which produces well defined rings or zones of vegetation around a pools' perimeter. This ringing occurs as water recedes and soil moisture changes. This is most obvious with pools that are deeper and have long periods of inundation. Most of the created pools demonstrated ringing by one or more species (see Photograph 6, Appendix A). Species producing distinct rings included *Orcuttia inaequalis* and *O. pilosa, Downingia bicornuta* and *D. ornatissima* and *Hordeum marinum ssp. gussoneanum.* As in natural pools many of these species may or may not eventually colonized the entire pool with slightly different age classes as the pools dried. Frequently the rings are broken or of uneven width and may vary from season to season. In many cases data collection along the transect did not include species that were present in high numbers but were limited in distribution or present in broken rings. Species richness data (see Tables 6B thru 16B, Appendix B) were collected throughout each entire pool and will include species not found in frequency, cover or diversity data. Therefore, diversity, cover and frequency values may be different than those obtained by random sampling.

Pool type also influences vegetative establishment. Bowl-like pools of moderate depth and intermediate type pools demonstrated greater stability in water holding capacity and seem to be a more appropriate design for many plant species, including *Orcuttia* species. After three seasons many of the swale-like pools at Site 4 were heavily infested with invasive grasses such as *Polypogon monspeliensis* and *Lolium multiflorum*. (see Photograph 9, Appendix A). These grasses began to occur during the 1994-95 season and produced a heavy thatch in several pools. The thatch appeared to prevent the growth of many other more desirable vernal pool species during the 1995-96 season. The shallow nature of these swale-like pools may have contributed to their vegetative decline because they could dry rapidly allowing the establishment of weedy species. In some cases timely grazing might have helped reduced the vigor and abundance of non-native grasses which germinate several weeks before many vernal pool plant species. In addition, many of the pools at Site 4 and swale Site 2 had gopher damage to their berms which resulted in premature drying of the pools. This undoubtedly had a negative impact on vernal pool vegetation.

7.2 Vegetative Cover

Absolute cover suggests many created pools are equivalent to or better than reference pools. For instance, created pools 2A, 2D, 4C, 4F and others have values similar to the reference pools (see Table2B, Appendix B). However, a large percentage of the cover in these pools was by weedy species. Other pools such as 2E, 3, 4I demonstrate variable values, however, most of their cover was by native species. For this project, we found absolute cover to be somewhat misleading.

In most pools, *Hordeum marinum gussoneanum* (Mediterranean or Vernal Pool Barley) is the dominant plant species. In many pools however there are few other vernal pool species that are dominant. Dominance by hydrophytic species in the 1995-96 season, (the third season), is apparent in Pools 1A, 1B, 2E, 3, 4B and 4I. Pools 4C, 4D and 4E also exhibit this trend, however, their diversity tends to be lower and some of the species present such as *Lolium multiflorum* and *Polypogon monspeliensis* are often considered to be weedy and invasive in vernal pools.

These data suggest bowl-like and intermediate pool types appeared to be most suitable for establishment of obligate wetland species because they hold water for longer periods of time than swale-like pools.

Although cover values vary for each species from season to season (see Table 2B, Appendix B) when the same species retain dominance over time those species are good indicators of a pool's character. Cover should not be examined alone.

Relative cover by native vernal pool endemics appears is a more specific method of evaluating vegetative success, however, it too can be misleading. For instance, reference Pool 6 has a very high value on 4/23/95 (see Table 3B, Appendix B). However, if relative cover of all vegetation is compared to relative cover by soil, it demonstrates that relative vegetation cover is only 0.12% (see Table 4B, Appendix B).

Other factors that may have lowered the values of native cover for many pools was due to sampling error. When the original transects were established permanent stakes were placed at each end of the transects. The stakes were placed with the assumption that the entire excavated basin would fill with water. Although some of the pools occasionally filled to the point of including both end stakes, the outer reaches of the transects were typically not inundated for long periods and in some cases were never inundated (see Photograph 10, Appendix A). The moisture regime in these areas tended to support *Hordeum marinum gussoneanum*, a non-native species frequently associated with moist, disturbed, edges of central valley vernal pools. This species is listed as a facultative species, one that has equal likelihood of growing in wetland or non-wetland habitats. <u>If the end stake placement had been less "optimistic", or if sampling had taken place only along that portion of the transects that were inundated for longer periods of time, then more created pools would have higher values of relative native cover.</u> It should also be noted that not all native species occurred along the sampling transect. For instance, Pool 3 contained both *Orcuttia pilosa* and *Orcuttia inaequalis*, however only *O. inaequalis* occurred along the transect. Since cover data reflect only those species occurring along the transect, *O. pilosa* was not represented.

7.3 Dominant Vegetation

Those vascular plant species providing 20% or greater relative cover for any of the three 1996 sample dates are listed in Appendix B, (see Table 5B). These data suggest that during the third sampling season most of the constructed pools were dominated by plants associated with central valley vernal pools. Furthermore, the same species tend to be dominant in both the created and reference pools.

Dominant species also satisfy U.S. Army Corps of Engineers, (COE), requirements for wetland status as far as vegetation is concerned for most of the constructed pools (see Tables 5B, 14B, 15B and 16B, Appendix B). These data (COE) do not distinguish between native and non-native species.

7.4 Species Richness

Data indicate overall species richness of created pools was comparable to nearby natural pools. Furthermore, species composition of created and natural pools was very similar (see Tables 6B, 7B and 8B, Appendix B). These data show that many created vernal pools have 90% or more of the native vernal pool species shared with the reference pools.

When examining richness of obligate wetland and falcultative wetland species during all seasons, many created pools demonstrated numbers equal to, or higher than, reference pools (see Tables 14B, 15B and 16B, Appendix B).

7.5 Frequency

Many vernal pool plant species exhibit short growing periods and they tend to occur in rings around a pools perimeter. This appears to have resulted in some species such as *Downingia bicornuta*, *Downingia ornatissima* being underrepresented in frequency data. Frequency coupled with cover data can indicate whether or not a species is clumped or evenly distributed. When examining *Downingia* species, these data suggest unclumped species. Non-quantitative field observations were in conflict with these data. *Downingia* species were quite numerous but limited in distribution in most pools.

The data do suggest that *Orcuttia* species were clumped in many pools, and that there was an increase in frequency over the three seasons. Data also suggest an increase in the frequency of *Eryngium vaseyi* is some pools. These data were supported by non-quantitative field observations.

Considering the apparent differences in the way these species were treated by the data, interpretation of frequency data should be done with care (see Appendix B for frequency data).

7.6 Diversity

Diversity values should not be examined alone when evaluating vernal pool success criteria. Other data such as species richness, frequency and cover should be considered as well. For example, Pool 2D in general has higher diversity values than many other pools (see Table 1B, Appendix B). Pools with similar values include Pool 2E, Pool 3 and Pool OL, a natural pool. However, if species richness data are examined it shows that most of the species found in Pool 2D are not vernal pool species. A much higher number of the species found in Pools 2E, 3 and OL are vernal pool species.

Created pools that show diversity values comparable to natural pools, and have many vernal pool species include, Pools 1B, 2E, 4B and 4I. Pools with lower values, but still supporting primarily vernal pool species include, Pools 1A, 3 and 7. One major difference between these two groups is the depth of the pools. Pools 1A, 3 and 7 are very deep and hold water for much longer periods than Pools 1B, 2E, 4B and 4I. The increased depth and longer inundation period prevents many species from growing in much of the pool thus reducing population size and species richness, factors inherent in the derivation of a diversity index.

7.7 Sensitive Plant Species

Seeds of three California listed Endangered species (Federal candidates) *Castilleja campestris* ssp. *succulenta*, *Orcuttia inaequalis* and *O. pilosa* were used as inocula in created pools. *C. campestris succulenta* was inoculated into a single bowl-like pool, site 1A. No *C. campestris succulenta* were observed during the life of the project. Several factors may have contributed to this lack of success. Site 1A was selected as the pool for cross fencing by individuals unaware of the presence of *Castilleja* inocula. On one occasion the gate to the protected side of the pool was left open and cattle entered the site. Therefore both sides of the pool were trampled and/or grazed. Probably two more critical factors in the lack of successful establishment was an extremely small seed supply and the fact that *Castilleja* tends to be found in shallower natural pools or at the edges of deeper pools. Site 1B is a deeper and seed may have been inundated for an excessive period of time.

Both species of *Orcuttia* were inoculated into several pools including bowl, swale and intermediate types. Both species germinated and set abundant seed during the 1993-94 season (see Photographs 4 and 5, Appendix A). During the 1994-95 season both species germinated and flowered. However, seed production may have been negatively impacted by two factors. Late season rains re inundated several pools as seed was maturing, however, both species set seed and demonstrated healthy populations during the 1995-96 season. Furthermore, both of these species demonstrated higher levels of frequency and cover in constructed pools than in reference pools (see Appendix B). The success of these two endangered vernal pool endemics is one of the most encouraging developments of this study (see Photographs 11 and 12, Appendix A).

8.0 FAUNA MONITORING METHODS

USFWS guidelines for monitoring animals were less detailed than those for plants. Vetebrate fauna were observed in the following ways. Birds were observed as pools were approached and species present recorded. Mammal tracks and signs made by opposum, racoon and California ground squirrel and Kangaroo rats were recorded when observed. Amphibians were observed as adults and as larvae which were were collected by sweeping the water column and pool bottoms with a standard 10 inch aquatic sweep net. Aquatic invertebrates were sampled and observed by sweeping the water column, pool bottoms and benthos with a standard 10 inch aquatic sweep net.

9.0 FAUNA, RESULTS and DISCUSSION

9.1 Vertebrates Associated With Vernal Pools

Several amphibians including Western Toads, *Bufo boreas*, Pacific Tree Frogs, *Hyla regila*, Western Spadefoot Toads, *Scaphiopus hammondi* and California Tiger Salamanders, *Ambystoma tigrinum californiense* are associated with vernal pools. Two of these species, California tiger salamanders and Western spadefoot toads breed almost exclusively in vernal pools in this region. Both are California Department of Fish and Game "Species of Special Concern" and are currently being evaluated as potential threatened or endangered species by the US Fish and Wildlife Service.

On February 28, 1994 approximately 125 Tiger salamander larvae and 75 Spadefoot toad tadpoles were transplanted from an eastern Fresno county vernal pool threatened by development to created pool 2E. Pool 2E was selected because it had populations of aquatic insects and algae that seemed sufficient to serve as a food source for the amphibians and because it possessed the general physical parameters desired for successful amphibian development.

Populations were monitored weekly for 8 weeks by sweeping the water column and pool bottom with a standard 10 inch aquatic sweep net. Spadefoot toads were not found after the first three weeks, however during the three week period definite growth and partial metamorphosis were observed. Tiger salamanders were observed for seven weeks with similar results. Although no adults were observed, these results indicate that water quality and food supplies were adequate for amphibian populations to survive. This assumption is further supported by the spontaneous appearance and reproduction of spadefoot toads in created pool 7 during all three seasons. Site 7 is a created pool that is near natural vernal pools and is physically similar to site 2E. Pacific Treefrog, *Hyla regila*, and Bullfrog, *Rana catesbiana* adults and Western Toad, *Bufo boreas* juveniles, two species that commonly reproduce in vernal pools were also observed at some of the created pools (see table 4C, Appendix C). The presence of these more common species is an indicator that water quality and other pool habitat conditions are satisfactory for amphibians.

9.2 Aquatic Invertebrates Associated With Vernal Pools

Many groups of aquatic arthropods pods are commonly found in natural vernal pools, several of which were observed in the created pools. Groups found in the created pools include the following groups of insects; Family Dyticydae (predaceous diving beetles), Family Corixidae (water boatmen), Family Chironomidae (blood worms), Family Culicidae (mosquitoes), Family Notonectidae (back swimmers) Order Odonata (dragon flies); the following crustaceans: Class Copepoda (copepods), Class Conchostraca (clam shrimp) and Class Branchiopoda (fairy shrimp) including *Branchinecta lynchi* and *Linderiella occidentalis* (see Tables 1C, 2C and 3C, Appendix C). Fairy shrimp and copepods were likely introduced as diapause eggs contained in soil from natural pools that was used as inocula. Insects, lacking diapause eggs probably migrated from nearby natural vernal pools or the Madera Equalization Reservoir. Conchostracans were introduced as adults in 1994 and were observed again during 1995 and 1996. The success of these groups (particularly the Branchiopoda) through all three seasons is an indicator that the created pools are suitable for common and endangered invertebrates.

9.3 Pollinators Associated With Vernal Pool Flora

Surveys for native solitary, pollen-specific (oligolectic) bees were performed at the artificial pools and natural pools at the Fenston ranch, one of the sources of inocula. Primary emphasis was placed on surveying vernal pool species of *Lasthenia*, *Limnanthes* and *Downingia*, all known to have specialist bees associated with them in other areas. Other vernal pool plants examined were *Mimulus tricolor*, *Gratiola ebracteata* and *Plagiobothrys stipitatus* ssp. *stipitatus*. The grasslands surrounding the created pools contained *Eschscholzia lobbii*, *Agoseris heterophylla* and *Sidalcea* sp., all of which are known to have associations with oligolectic bees in other parts of their ranges.

Some of the constructed pools produced good bloom of *Downingia*, and lesser bloom of *Lasthenia*, *Gratiola ebracteata* and *Mimulus tricolor*. Generalist bees were found in association with *Downingia* and *Lasthenia*, however oligolectic bees were not observed. The same generalist bees were found in association with *Eschscholzia* and *Agoseris* in the surrounding grasslands. No bees were found associated with *Mimulus* or *Gratiola*. A few natural pools west of created site 4 contained *Limnanthes douglasii rosea* and *Lasthenia sp*. One species of oligolectic bee, *Andrena limnanthis* was found associated with *Limnanthes*. No *Limnanthes* occurred in created pools during any of the three seasons. Visits to other vernal pool sites in Madera and Fresno counties produced only a few oligolectic bees.

The lack of oligolectic bees at created pools and the low numbers at nearby natural pools during all three seasons may be due to a number of factors. First, a prolonged series of drought years may have depressed populations to a level from which recovery will take several years of "normal rainfall". Second, heavy, mid season rains re inundated much of the vernal pool flora in both 1993-94 and 1994-95 seasons. Third, recent studies indicate many oligolectic bees migrate very short distances only. Therefore, it may take several years before the bees are nesting near enough to the created pools for the pools to be found. It is possible/probable that all of these factors have interacted to produce the low populations of oligolectic bees found in the vicinity of the created pools and that better conditions in the future may aid population recovery.

9.4 Effects of Livestock

Although the effects of livestock were not systematically evaluated, general observations were made. On created Pool 1A, the cross fenced pool and Pool 7, the unfenced pool, cattle trampling and/or grazing definitely reduced the establishment of vegetation during the 1993-94 season. Areas open to livestock exhibited more much higher percentage of bare ground and less species richness (see Photograph 7, Appendix A). Damage from grazing and trampling was also observed on unfenced, nearby natural pools. However, the damage was not as severe as that exhibited by the created pools. When constructed, almost all vegetation present in and immediately surrounding the created pools was destroyed. Lacking any vegetation to limit hoof damage, the new pools were extremely susceptible to livestock damage. Disturbed areas further from unfenced pools such as the bentonite mixing area upslope from Pool 7, and disturbed areas near fenced pools such as site 4, tended to revegetate more quickly than disturbed areas immediately adjacent to unfenced pools. Presumably available water attracts cattle, promoting greater damage. The fence bisecting Pool 1A provided scratching posts for cattle and damage along the outer side of the fence was noticeable throughout all three seasons.

As vegetation became more established, both Pool 7 and Pool 1A exhibited less damage due to livestock (see Photograph 8, Appendix A). Furthermore, observations made during the 1994-95 and 1995-96 seasons suggest some of the created pools might benefit from limited, properly timed grazing to reduce the frequency of non-native, invasive grasses (see Photograph 9, Appendix A).

10.0 CONCLUSIONS

10.1 Trends in Vernal Pool Habitats Over Time

If the created pools develop characteristics similar to those of nearby natural pools, it is expected that perennial wetland species such as *Eryngium vaseyi* and *Eleocharis macrostachya* will increase in frequency. In addition, prolonged periods of anaerobic soil conditions should gradually impede germination of annual upland, weedy, species remaining in the seed bank thereby reducing competition for less aggressive, vernal pool species. Other incremental changes may occur depending on physical alteration due to runoff patterns, erosion, rodent or livestock activities.

The successful establishment of vernal pool organisms seems to require that both bowl-like and intermediate type pools be constructed. Bowl-like pools held water for longer periods of time which allows for better success of amphibians. Pool 7 which supported Western spade foot toads for the life of the project is such a pool. However, the lengthy inundation period of Pools 7, 1A and 3, restricted the establishment of the majority vegetation to the outer areas of the pools. Intermediate pools such as 1B and 4I and shallower bowl-like pools such as 2E appear to be better suited for establishment of vegetation. The occurence of tree frogs in Pool 2E, also indicates that a shallow bowl may be appropriate habitat for amphibians.

10.2 Current Status of the Project With Respect to Area-Based Goals

The goals of this project were to develop methods for CalTrans that are suitable for enhancing degraded natural vernal pools specifically within the east side of the central San Joaquin Valley, and/or creating artificial pools capable of supporting a wide variety of vernal pool species.

Created pools demonstrated several successes during all three seasons. *Orcuttia inaequalis* and *O. pilosa*, two California State listed species and Federal candidate species, reproduced during all three seasons, as did many more common vernal pool plant species. Both of these species had greater frequency and cover values in created pools than in reference pools. Several other sensitive vernal pool plant species not used as inocula for this study, including *Neostapfia colusana*, *Chamaesyce hooveri* and *Tuctoria greenei* which occur in San Joaquin Valley vernal pools similar to many of the created pools. *Tuctoria* and *Neostapfia* are close relatives of *Orcuttia* and using the methodologies and techniques applied on this study to establish these species should be considered.

Overall species richness in created pools was comparable to that found in nearby natural pools. Obligate wetland species richness was greater in the created pools during the 1993-94 season, however, as discussed previously created pools held water for longer periods than natural pools during the 1993-94 season. Species richness for facultative wetland, facultative, facultative upland and upland species was comparable between created and nearby natural pools.

Pollen specific (oligolectic) bees associated with some vernal pool flora were not observed at the created pools. A few oligolectic bees were observed at a nearby natural pool supporting a small population of *Limnanthes douglassi* (meadow foam), species not found at the created pools. Both the 1993-94 and 1994-95 seasons produced rains that at least partially re inundated created pools during bloom periods, which may have contributed to the lack of oligolectic bees. In addition, recent studies indicate many oligolectic bees migrate relatively short distances and it may require several seasons for the created pools to fall within the foraging range of these bees. Compacted soils in the area may also prevent these bees from building their nests in the ground. Inoculation of created pools with *Limnanthes* and rototilling or other methods for loosening nesting sites and introduction of preemergent pupae or recently emerged adults should be investigated as a method to promote pollinator establishment at created pools.

Federally listed vernal pool fairy shrimp, *Branchinecta lynchi* and *Linderiella occidentalis* were observed in some of the created pools in the 1993-94, 1994-95 and 1995-96 seasons. Inoculation with soils from natural pools known to support these species should be expected to result in the establishment of vernal pool fairy shrimp in enhanced or additional created pools.

Both Western spadefoot toad tadpoles and California tiger salamander larvae grew when transplanted into Site 2E during spring 1994. Although, they were not found at this location during spring 1995, this is probably due to the relatively small number or individuals transplanted and lack of burrows not pool conditions. This is supported by the fact that during both seasons Western spadefoot toads successfully colonized and reproduced in Pool 7 for each of the three season. In addition to these sensitive species, Pacific treefrog adults and Western toad juveniles were observed at some of the created pools.

10.3 Future Change

It is probable that bowl-like pools will remain stable longer than swale-like pools. The swale pools were designed to overflow which can result in levee failure. In addition, levees creating the swales are susceptible to damage by burrowing rodents and other digging animals which can result in untimely water loss from the pools.

Although gradual changes in overall pool characteristics are expected in the created pools, these changes are likely to be different than those in pools that are only enhanced. Enhancement of a pool implies an existing (albeit degraded) pool with intact claypan or hardpan. Thus, concerns about bentonite are eliminated. Based on the results of this project, additional contouring and inoculation of degraded vernal pools appears to be a viable method for mitigation purposes in areas where unavoidable significant negative impacts occur.

CalTrans has purchased 200 acres of property that has intact and degraded vernal pools adjacent to State Highway 41 north of Avenue 12 in Madera County. This site posseses the necessary soil characteristics for the enhancement of degraded pools and the possible construction of additional pools. Along with the techniques established for this project and modified sampling procedures the outlook for successful long term mitigation in the furture is promising.

10.4 Recommendations for Future Pool Construction in the San Joaquin Valley

1) Prior to construction decisions must be made concerning what type(s) of organism(s) are desired in the pools. Vertebrates and some plant species such as *Orcuttia sp*. require pools that hold water for longer periods than do many other species. If these are desired, then site selection should allow for bowl-like pools to be constructed. For many other plant species and invertebrates, sites allowing for the construction of intermediate or swale-like pools may be selected.

2) Vernal pool plant seeds and soil from nearby existing vernal pools should be collected for use as inocula for pools to be constructed. Collection followed previously established guidelines which stated that no greater than 15% of the seeds or vegetation of any given species be collected from any single site. Soil collection is recommended to help establish aquatic invertebrates that produce diapause eggs and any possible mycorrhizal fungi associated with vernal pool plants. Collection should be performed after pools have dried and seeds have matured and should be used as inocula as soon as possible. Inocula should not be stored for more than one year unless it is unavoidable. Inocula should be stored in a dry room temperature location. A rotary lawn mower with catching bag is useful for collecting seeds from certain plants of moderate height, however, if seeds are easily dispersed by shaking, hand collection may be preferred. Low growing plants may be collected by hand, with a line trimmer, a shovel or rake. The specific tool depends on how easily seeds are dispersed.

3) Determine that each proposed site has an underlying durapan (semi-impermeable layer) so that created depressions will hold water. Delineate each proposed site.

4) Construction should begin and be completed during the late summer and early fall before the first fall rains. Remove the topsoil from each site and store it for reuse. Heavy equipment

operators using skip loaders and road graders should excavate and contour a basin slightly deeper than desired for the completed pool (topsoil will be replaced). Note: If possible collect sufficient topsoil from pools to be impacted for use in constructed pools. This will eliminate much of the problem caused by weedy species.

5) Replace topsoil and perform final contouring with hand tools (rakes and shovels). Spread the inocula and rake evenly into the topsoil throughout the entire pool. Avoid spreading inocula on very windy days to prevent excessive losses of seeds and collected soils.

6) Depending on the location a fence may be desired at least during the first few years while pools are more sensitive to disturbance. The decision to fence should take into consideration potential livestock impacts, human disturbance and any other factors specific to a particular site. If fences are erected, a gate is recommended so than grazing can be utilized for the control of weedy species if desired.

7) Monitor using appropriate methods for a time period approved by proper agencies.

10.5 Monitoring Modifications

Either multiple transects or a randomized quadrat method are recommended in conjunction with a permanent transect rather than only a single permanent transect. This would help correct some of the apparent biases of the single transect method. In addition, each season only the area that becomes inundated for twelve continuous days or more during the growing season should be monitored. Inundation of this period should be sufficient to inhibit the establishment of non-vernal pool plant species and stimulate the establishment of desirable species. This would also provide more realistic data on cover by vernal pool and non-vernal pool species.

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APPENDIX A

PHOTOGRAPHS of the PROJECT

Photograph 1. Site 4, a swale-like series of created vernal pools.

Photograph 2. Pool 3, a single bowl-like created vernal pool.

Photograph 3. Pool 1B, an intermediate type created vernal pool.

4/14/95 Vascular Plant Frequency

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Agoseris heterophylla															0.14					
Bromus hordeaceus		0.04	0.19	0.14				0.05			0.35	0.09			0.10	0.06				
Castilleja exserta															0.05					
Crassula connata						0.48									0.05					
Downingia bicornuta																0.02				
Downingia ornatissima		0.48			0.12					0.06					0.05	0.17	0.07			
Echinochloa crus-gali												0.04								
Eleocharis macrostachya		0.12						0.11		0.13			0.03			0.07				0.18
Erodium cicutarium	0.02	0.04	0.17	0.12	0.12	0.61		0.08								0.04				
Eryngium vaseyi																0.42				0.07
Gratiola ebracteata					0.42		0.02	0.02	0.02	0.03	0.05	0.04			0.05	0.19				
Hordeum gussoneanum	0.06	0.20	0.38	0.18	0.33		0.07	0.16	0.44	0.39	0.90	0.20	0.28	1.00	0.19	0.41	0.07	0.12		0.15
Hordeum leporinum								0.03												
Isoetes howelli																	0.23			
Juncus bufonius																	0.03			0.13
Pectocarya penicillata																				0.20
Plagiobothrys stipitatus		0.80	0.55	0.26	0.54	0.26	0.04	0.13	0.71	0.26	0.10	0.73	0.72			0.78	0.10			
Psilocarphus brevissimus		0.32	0.14	0.10	0.09	0.35	0.02	0.47	0.16		0.04	0.09					0.07	0.03		0.09
Trifolium depauparatum								0.02		0.03										
Vulpia myuros											0.05					0.04				
*Natural Pool																				

4/5/94 Vascular Plant Frequency

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Agoseris heterophylla																			0.04	
Bromus hordeaceus						0.05		0.03						0.46		0.43		0.09	0.02	
Bromus rubens	0.04	0.13		0.06	0.10	0.46	0.13	0.08	0.71	0.36	0.20	0.20	0.66	0.04	0.43	0.02				
Castilleja exserta															0.05					
Crassula connata						0.41											0.07			
Dichelostemma capitatum		0.25	0.12	0.02						0.03					0.10					
Downingia bicornuta									0.05							0.15				
Downingia ornatissima		0.75	0.02						0.05							0.20				
Erodium cicutarium		0.04	0.22			0.50				0.10	0.10	0.07		0.81	0.05	0.02			0.05	0.25
Eryngium vaseyi																0.02	0.63		0.82	0.69
Gratiola ebracteata		0.13	0.76	0.02	0.21	0.06	0.02	0.02	0.10	0.05	0.07	0.06			0.30					
Hordeum gussoneanum			0.12													0.02	0.82			0.23
Hordeum leporinum											0.40	0.04		0.04						
Isoetes howelli			0.51	0.04	0.05	0.05														
Juncus bufonius		0.04						0.14	0.21	0.07			0.16		0.14	0.09		0.03		
Lupinus bicolor			0.02			0.09														
Lythrum hyssopifolium																			0.05	0.02
Mimulus tricolor								0.50			0.02									
Pectocarya penicillata																			0.05	0.50
Plagiobothrys stipitatus			0.76	0.18	0.14	0.77	0.04	0.03	0.66	0.29	0.10	0.13	0.38	0.50		0.83	0.63		0.34	0.10
Psilocarphus brevissimus	0.02	0.46	0.66	0.27	0.17	0.55	0.15	0.02	0.73	0.16	0.10	0.22	0.50	0.08		0.11	0.74		0.84	0.83
Trifolium depauparatum																			0.05	
Vulpia myuros										0.07				0.08	0.14					
*Natural Pool																				

4/20/94 Vascular Plant Frequency

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Bromus hordeaceus				0.06	0.02	0.57		0.06			0.05			0.19		0.06				0.04
Bromus rubens							0.02			0.03			0.03							
Crassula connata							0.04													
Downingia bicornuta		0.88	0.60		0.40	0.35			0.09		0.05					0.30				
Downingia ornatissima		0.32	0.02	0.02												0.02				
Erodium cicutarium		0.04	0.05	0.06		0.30								0.04		0.02	0.03			0.14
Eryngium vaseyi					0.05												0.50		0.52	0.49
Gratiola ebracteata	0.04	0.10		0.16		0.09	0.06									0.09				
Hordeum gussoneanum		0.12		0.08	0.02				0.20	0.26	0.50	0.07	0.22	0.58	0.76	0.09	0.96		0.43	0.41
Hordeum leporinum		0.08			0.12		0.07	0.09	0.07		0.05	0.07				0.11				
Juncus bufonius			0.43	0.06	0.09		0.04	0.11	0.13	0.07		0.02			0.14	0.07				
Mimulus tricolor								0.05	0.05	0.03										
Orcuttia inaequalis	0.02	0.04		0.02		0.04														
Orcuttia pilosa									0.02	0.02	0.65	0.30	0.80	0.63		0.14	0.48		0.05	
Plagiobothrys stipitatus	0.02	0.64	0.69	0.36	0.26	0.22	0.09	0.06	0.71	0.26		0.29	0.59	0.04		0.78	0.10			
Psilocarphus brevissimus	0.02	0.24	0.60	0.26	0.37		0.22	0.03	0.42	0.19	0.05	0.27	0.22	0.04		0.04	0.30			
Vulpia myorus						0.22			0.07	0.20										
*Natural Pool																				

5/23/94 Vascular Plant frequency

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Agoseris heterophylla														0.04	0.05				0.04	0.07
Bromus hordeaceus								0.06		0.03									0.01	
Eremocarpus setigerus					0.02															0.09
Erodium cicutarium		0.04		0.04								0.04					0.03			0.01
Eryngium vaseyi					0.09													0.60	0.65	0.55
Hordeum gussoneanum	0.02	0.16		0.10	0.16		0.11	0.06	0.22	0.13	0.30	0.07	0.10	0.54			0.05	0.05	0.07	
Hordeum leporinum								0.05												
Juncus bufonius									0.02											
Lythrum hyssopifolium					0.02		0.04		0.09							0.04		0.02		
Orcuttia pilosa									0.11	0.10										
Plagiobothrys stipitatus	0.08			0.02		0.02													0.13	
Trifolium hirtum														0.04						0.07
*Natural Pool																				

Table 16B. Obligate, (Obl) and Facultative Wetland, (FacW) plant species occurring in created and natural pools for the 1995-96 season.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Alopecurus saccatus															X				X	X
Callitriche marginata	X		X	X	X		X					X	X			X			X	X
Downingia bicornuta		X	X	X	X	X	X	X	X			X				X				
Downingia ornatissima		X	X	X	X			X	X		X					X				
Echinochloa crus-gali																				
Eleocharis macrostachya													X							X
Eryngium vaseyi																				
Gratiola ebracteata	X	X	X	X	X	X	X	X	X	X	X	X	X			X				
Isoetes howellii			X	X	X	X			X											
Juncus bufonius	X	X	X	X	X		X	X	X	X		X	X		X	X				
Lasthenia fremontii		X										X			X					
Lilaea scilloides							X		X		X	X								
Lythrum hyssopifolium																				
Mimulus tricolor							X	X	X											
Orcuttia inaequalis	X	X	X	X	X		X	X										X		
Orcuttia pilosa								X	X	X	X	X	X			X		X		
Plagiobothrys stipitatus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
Polypogon monspeliensis																				
Psilocarphus brevissimus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
Sagittaria latifolia																				
Veronica peregrina xalapensis										X	X					X				

*Natural Pool

4/28/95 Vascular Plant Frequency

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Agoseris heterophylla															0.10					
Bromus hordeaceus	0.02			0.12				0.03				0.04								
Bromus rubens								0.03												
Downingia bicornuta		0.56		0.10	0.42				0.02							0.15				
Downingia ornatissima		0.08								0.03										
Eleocharis macrostachya		0.04						0.08		0.19					0.05	0.09				0.18
Erodium cicutarium					0.02	1.00		0.09												
Eryngium vaseyi																	0.27		0.33	0.30
Gratiola ebracteata				0.04	0.30		0.02	0.09		0.07		0.11			0.05	0.07				
Hordeum gussoneanum	0.08	0.32	0.69	0.36	0.40		0.11	0.11	0.51	0.29		0.20	0.28	1.00	0.19	0.41	0.03	0.07		0.14
Hordeum leporinum	0.02							0.06												
Juncus bufonius										0.07						0.04			0.09	0.57
Mimulus tricolor									0.04											
Orcuttia inaequalis					0.14													0.12		
Orcuttia pilosa									0.48	0.35						0.11				
Pectocarya penicillata																			0.07	0.18
Plagiobothrys stipitatus	0.02	0.76	0.41	0.38	0.49		0.15	0.18	0.62	0.58	0.05	0.69	0.72			0.72	0.03		0.67	0.18
Psilocarphus brevissimus	0.02	0.40	0.05	0.10	0.21		0.09	0.05	0.47	0.36	0.20	0.38	0.16			0.07			0.49	0.54
Triphysaria eriantha															0.05					
*Natural Pool																				

5/12/95 Vascular Plant Frequency

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Bromus hordeaceus	0.02															0.04				
Downingia bicornuta				0.06	0.37														0.18	0.07
Downingia ornatissima					0.07		0.02	0.02												
Eleocharis macrostachya							0.04	0.15												0.18
Erodium cicutarium	0.02			0.02																
Eryngium vaseyi		0.02		0.07		0.02											0.47		0.47	
Gratiola ebracteata				0.05							0.05									
Hordeum gussoneanum	0.08		0.48		0.26		0.11	0.23	0.62	0.26	0.45	0.07	0.34	1.00	0.14	0.17	0.33	0.03	0.26	0.23
Isoetes howellii																				0.20
Juncus bufonius											0.05				0.10					0.02
Lythrum hyssopifolium								0.02	0.02		0.05		0.03			0.02				0.09
Mimulus tricolor																				0.04
Orcuttia inaequalis					0.30															
Orcuttia pilosa										0.42	0.25								0.05	
Pectocarya penicillata																				0.02
Polypogon monspeliensis		0.36		3.00																
Psilocarphus brevissimus				0.21		0.13													0.39	0.46
*Natural Pool																				

4/6/96 Vascular Plant Frequency

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Agoseris heterophylla						0.04														
Bromus diandrus			0.21		0.21															
Bromus rubens					0.02															
Cynodon dactylon		0.12		0.06											0.09					
Dichelostemma capitatum			0.02		0.02															
Echinochloa crus-gali	0.02																			
Eleocharis macrostachya							0.04	0.06		0.10			0.03			0.13	0.03			0.16
Erodium cicutarium			0.14	0.02	0.28	0.43	0.02													
Eryngium vaseyi					0.02		0.44		0.02	0.03						0.04	0.03		0.10	0.32
Gratiola ebracteata		0.04					0.02		0.02	0.58	0.05					0.24				
Hordeum gussoneanum		0.52	0.57			0.43	0.05	0.17		0.13	0.80	1.00	0.37	1.00	0.48	0.50	3.00		0.25	0.07
Juncus bufonius							0.02													0.02
Lythrum hyssopifolium													0.06			0.04				0.14
Plagiobothrys stipitatus	0.04	0.68	0.09	0.68	0.58		0.40	0.25	0.13	0.74	0.30		0.17			0.33	0.16		0.60	0.50
Psilocarphus brevissimus	0.02	0.60		0.44	0.21		0.23	0.02	0.11	0.22	0.05				0.14	0.04	0.27		0.44	0.63
Trifolium depauparatum			0.04		0.05		0.02													
*Natural Pool																				

4/23/96 Vascular Plant Frequency

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Agoseris heterophylla					0.05	0.04														
Alopecurus saccatus		0.12																		
Bromus diandrus	0.08		0.57	0.08	0.07	0.13		0.05												
Bromus hordeaceus	0.08		0.42	0.04	0.07	0.56						0.02							0.04	
Bromus rubens				0.02																
Cicendia quadrangularis														0.04		0.11				
Cynodon dactylon														0.15						
Dechampsia danthonioides		0.12										0.18	0.03			0.20				
Downingia bicornuta				0.20			0.02									0.24				
Downingia ornatissima							0.05			0.09						0.02				
Eleocharis macrostachya							0.02	0.08		0.12			0.09			0.15	0.03			0.27
Epilobium cleistogamum																			0.10	0.30
Erodium cicutarium			0.26	0.08	0.23	0.52	0.02													
Eryngium vaseyi					0.02	0.04	0.20		0.09							0.13	0.03		0.20	0.37
Gratiola ebracteata							0.11			0.23				0.04				0.02		
Hemizonia fitchii																				0.02
Hordeum gussoneanum	0.22	0.52	0.93	0.52	0.49	0.26	0.16	0.26	1.00	0.29	1.00	0.33	0.72		1.00	0.48	0.03	0.07	0.30	0.18
Hordeum leporinum			0.02			0.04														
Juncus bufonius														0.08						0.07
Lasthenia fremonti		0.12																		
Lythrum hyssopifolium							0.07			0.03				0.08		0.02		0.07		0.20
Orcuttia pilosa										0.06										
Plagiobothrys nothofulvus																				0.12
Plagiobothrys stipitatus	0.18	0.52		0.68	0.67		0.20	0.25	0.07	0.74	0.30	0.22	0.50	0.38		0.40	0.03	0.02	0.79	0.52
Polypogon monspeliensis		0.04														0.09			0.02	
Psilocarphus brevissimus	0.02	0.44		0.34	0.16		0.25	0.05	0.15	0.23	0.05	0.24		0.19		0.18		0.02	0.46	0.86
Psilocarphus tenellus														0.12						
Sagina apetla																				0.02
Sonchus oleraceus					0.02															
Vulpia myuros						0.21														
*Natural Pool																				

5/14/96 Vascular Plant Frequency

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Alopecurus saccatus															0.38					
Brodiaea elegans		0.08																		
Bromus diandrus			0.57	0.08	0.02	0.17														
Bromus hordeaceus	0.04		0.17		0.02	0.30		0.03												
Cynodon dactylon															0.09			0.02		
Dechampsia danthonioides		0.12										0.02	0.03			0.18				
Downingia ornatissima																		0.02		
Eleocharis macrostachya		0.28						0.08		0.26			0.09			0.09				0.23
Erodium cicutarium				0.02		0.26														
Eryngium vaseyi					0.12	0.13		0.03	0.09	0.03						0.07	0.03		0.28	0.41
Hordeum gussoneanum	0.22	0.64	0.78	0.46	0.63	0.35	0.05	0.31		0.13	0.90	0.29	0.60	1.00	0.52	0.54	0.07	0.15	0.39	0.29
Hordeum leporinum						0.04														
Isoetes howelli																0.02		0.02		
Juncus bufonius																				0.04
Lythrum hyssopifolium								0.02							0.05	0.05		0.12		0.05
Lolium multiflorum												0.14	0.28							
Orcuttia pilosa	0.04						0.76	0.03		0.23	0.15					0.03		0.13	0.28	
Plagiobothrys stipitatus	0.12							0.34					0.09					0.03	0.26	0.04
Polypogon monspeliensis	0.41							0.14				0.64	0.28			0.24			0.26	0.02
Psilocarphus brevissimus	0.02	0.48						0.02		0.03					0.05	0.11				0.73
*Natural Pool																				

APPENDIX C

WILDLIFE DATA

Table 1C. Anostraca distribution within created and nearby natural pools.

Pool	*Branchinecta lynchi*			*Linderiella occidentalis*		
	1993-94	1994-95	1995-96	1993-94	1994-95	1995-96
1A						
1B	X	X	X	X	X	
2A	X	X				
2B						
2C		X				
2D						
2E			X			
3						
4A	X					
4B						
4C						
4D						
4E						
4F						
4G						
4I	X		X			
6*		X	X			
7						
OR*		X	X			
OL*		X	X			

*Natural Pool

Table 2C. Aquatic insects observed in created and nearby natural pools.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Anisoptera										X								X	X	
Chironomidae	X				X		X	X	X	X		X	X	X		X		X	X	X
Corixidae	X	X			X		X	X		X	X		X			X		X	X	X
Dytiscidae	X	X					X	X		X						X		X	X	X
Gyrinidae	X						X	X								X		X		
Notonectidae	X						X	X			X					X		X	X	
Anisoptera																				

*Natural Pool

Table 3C. Miscellaneous aquatic invertebrates observed in created and nearby natural pools.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Group																				
Acarina	X						X													
Cladocera	X						X			X								X	X	X
Conchostraca							X	X												
Copepoda								X											X	
Ostracoda	X						X	X		X								X	X	X

*Natural Pool

Table 4C. Amphibians observed in created and nearby natural pools.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Hyla regilla	X						X	X										X	X	X
Rana catesbeiana	X						X	X										X		
Scaphiopus hammondi																		X	X	X

*Natural Pool

APPENDIX D

HYDROLOGY DATA

Table 1D. Precipitation data from the Daulton Station for 1993-94, 1994-95 and 1995-96 seasons.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
93-94	0.00	1.22	0.91	1.73	2.32	0.24	1.85	1.54	0.00	0.00	0.00	0.00
94-95	1.65	2.16	1.62	7.92	1.09	6.65	1.40	1.64	0.94	0.00	0.00	0.00
95-96	0.00	0.00	2.85	2.62	3.78	2.53	1.11	0.83	0.31			

Table 2D. Inundation for the 1993-1994 season. (Does not indicate complete inundation)

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
12/3/93	X						X	X		X	X	X				X		X		
12/18/93	X	X		X	X	X	X	X	X	X	X	X	X			X		X		
1/2/94	X	X		X	X	X	X	X	X	X	X	X	X			X		X		
1/9/94	X	X	X	X	X		X	X	X	X	X	X	X			X		X		
2/5/94	X	X	X	X	X	X	X	X	X	X	X	X	X			X		X		
2/11/94	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X		
2/16/94	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X		
2/20/94	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X
2/24/94	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
3/4/94	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X		
3/9/94	X	X	X	X	X	X	X	X	X	X	X	X	X			X		X		
3/19/94	X	X		X	X		X	X		X	X	X	X					X		
4/5/94	X			X	X		X	X										X		
4/11/94	X	X	X	X	X		X	X	X	X	X	X	X			X		X		
4/20/94	X			X	X		X	X										X		
5/1/94	X	X	X	X	X		X	X	X	X	X	X	X		X	X		X		
5/23/94	X	X	X	X	X		X	X	X	X	X	X	X			X		X		
6/7/94	X			X			X	X										X		
6/23/94								X										X		

*Natural Pool

Table 3D. Inundation for the 1994-1995 season. (Does not indicate complete inundation)

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
10/24/94	X						X	X										X		
11/12/94	X	X		X	X		X	X		X	X	X				X		X		
11/20/94	X	X		X	X		X	X	X	X	X					X		X		
12/27/94	X	X	X	X	X		X	X	X	X	X	X	X		X	X		X		
1/8/95	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
1/22/95	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X
1/31/95	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
2/10/95	X	X		X	X		X	X	X	X	X	X	X		X	X	X	X	X	X
2/24/95	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X
3/12/95	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3/17/95	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X
3/31/95	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X
4/14/95	X			X			X	X		X		X						X	X	X
4/28/95	X						X	X										X		
5/12/95	X	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X	X
5/31/95	X						X	X										X		
6/16/95	X							X										X		

*Natural Pool

Table 4D. Water loss due to evaporation and percolation for the 1994-95 season.

Pool	Evaporation	Percolation
1B	3.12"	0"
2E	3.75"	0.25"
4I	3.57"	0.37"
OL*	3.12"	0"

*Note: N1 reading for 1 week only pipe was disturbed by cattle prior to second reading. Some water loss attributed to evaporation may be a result of cattle drinking.

Table 5D. Water chemistry data for vernal pools studied for this project. Pools were tested three times during Spring of 1995, early season, mid season and late season.

Pool/Time	pH	ECe	NH_3	NH_4^+	NO_3	PO_4^{3-}	P	Temp °C
1B Early	8.1	0.23	0.60	0.65	0	0	0	14
Mid	6.9	0.27	0.72	0.78	0	0.50	0.16	14
Late	7.9	0.34	0.72	0.78	0	0	0	17
2E Early	7.0	0.08	0.48	0.52	0	0.40	0.13	14
Mid	6.8	0.09	0.84	0.91	0	0.30	0.10	15
Late	7.8	0.11	1.20	1.30	0	2.20	0.73	17
4I Early	6.5	0.14	0.96	1.04	0	0.35	0.11	18
Mid	6.3	0.20	1.08	1.17	0	0.50	0.16	19
Late	8.9	0.23	1.44	1.56	0	0.20	0.06	25
OL Early	7.2	0.10	1.56	1.69	0	2.20	0.73	19
Mid	6.2	0.10	1.32	1.43	0	1.70	0.56	15
Late	6.4	0.13	1.20	1.30	0	1.70	0.56	17
OR Early	9.0	0.12	0.84	0.91	0	2.00	0.66	19
Mid	6.8	0.10	0.96	1.04	0	0.50	0.16	15
Late	6.4	0.10	1.08	1.17	0	0.70	0.23	18

APPENDIX E

SOILS DATA

Table 1E. Comparison of soil texture and chemistry from the created pool liner prior to the first year's wet season and soils from natural pools at the nearby Fenston Ranch.

Created Pools					Fenston Ranch			
Pool	pH	ECe	Clay		Pool	pH	ECe	Clay
		dSm	%				dSm	%
1A	7.1	1.2	15		H	6.12	0.24	32
2E	7.2	1.3	15		F	5.82	0.26	17
3	6.85	1.39	14.0		E	5.70	0.27	25
4A	7	1.4	13		A	5.83	0.16	19
4B	6.9	1.5	11		Average	5.87	0.233	23
4C	7.1	1.7	15					
4D	7.2	2.1	17					
4E	7.1	1.7	13					
4F	5.6	1.4	15					
4I	6.9	1.6	11					
7	7.2	1.5	16					
Average	6.99	1.53	14.6					

*subsoil underlying pool liner

Table 2E. Comparison of soil texture and chemistry from the created pool liner prior to the first years wetting with samples collected after one, two and three wet seasons.

	1993 (Pre Wetting)			1993-94			1994-95			1995-96		
Pool	pH	ECe dSm	Clay %	pH	ECe dSm	Clay %	pH	ECe dSm	Clay %	pH	ECe dSm	Clay %
1A	7.1	1.2	15	7.3	0.4	20	7.5	1.88	15	7.3	0.70	16
2E	7.2	1.3	15	6.9	0.2	18	7.7	0.64	12	7.1	0.90	22
3	6.8	1.4	14	6.6	0.5	16	6.1	1.02	10	6.3	0.60	14
4A	7.0	1.4	13	5.5	1.7	12	5.6	1.41	8.4	6.4	0.80	10
4B	6.9	1.5	11	6.9	0.5	17	7.4	1.04	14	7.4	0.60	26
4C	7.1	1.7	15	7.4	0.4	20	8.2	0.4	15	7.8	0.70	28
4D	7.2	2.1	17	6.0	1.1	15	6.1	1.12	12	6.8	0.40	24
4E	7.1	1.7	13	6.5	1.5	16	6.9	1.06	12	6.8	0.80	25
4I	6.9	1.6	11	6.4	0.6	20	6.1	0.79	18	6.3	0.90	28
7	7.2	1.5	16	6.8	0.8	20	6.5	0.69	16	6.3	0.50	30
Ave.	7.0	1.5	14.6	6.4	0.69	15.7	6.8	0.69	13.2	6.8	0.68	22.3

Absolute Vegetation Cover

Pool 4G	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Agoseris heterophylla		5.71		4.05	1.43		4.64		
Alopecurus saccatus			zero			zero			0.95
Bromus hordeaceus		0.24	plant			plant			
Bromus rubens	37.14		cover			cover			
Castilleja exserta	0.12	0.71	this			this			
Crassula connata		0.71	date			date			
Cynodon dactylon									3.33
Dichelostemma capitatum	1.43								
Downingia ornatissima		0.12							
Eleocharis macrostachya					0.12				
Erodium cicutarium	0.71								
Gratiola ebracteata		0.12			0.12				
Hordeum gussoneanum		3.93		56.19	5.60			9.41	59.28
Juncus bufonius	1.55			1.55				8.10	
Lythrum hyssopifolium									0.12
Psilocarphus brevissimus									0.12
Triphysaria eriantha					0.12				
Vulpia myuros	12.14								
Total Absolute Cover	53.09	11.54	0.00	61.79	7.39	0.00	4.64	17.51	63.80

Pool 41	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus hordeaceus	13.38			0.37					
Bromus rubens	0.69								
Cicendia quadrangularis						0.50			
Deschampsia danthonioides		0.05			2.08	1.20		3.61	3.38
Downingia bicornuta	4.95	0.05		5.46		0.83			
Downingia ornatissima	0.93	2.87		0.28		0.46			
Eleocharis macrostachya			1.20		2.82	6.80			4.17
Erodium cicutarium	0.28	0.09		0.28					
Eryngium vaseyi	0.28		0.09			3.05			1.30
Gratiola ebracteata	3.70	2.08	0.83	0.19					
Hordeum gussoneanum	0.28	24.72	41.71	2.22	31.62	45.60		6.07	41.94
Hordeum leporinum				3.94					
Isoetes howellii									0.05
Juncus bufonius	4.40			4.44					
Lythrum hyssopifolium			0.09				0.97	0.69	0.14
Orcuttia pilosa				8.15	3.38				0.05
Plagiobothrys stipitatus	45.28	43.01	3.24	42.87	36.30				8.80
Polypogon monspeliensis								1.16	
Psilocarphus brevissimus	1.16		0.09	0.09	0.19				0.28
Total Absolute Cover	75.33	72.87	47.25	68.29	76.39	58.44	0.97	11.53	60.11

Absolute Vegetation Cover

Pool 6	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Crassula connata	0.58								
Downingia ornatissima		0.58							
Eleocharis macrostachya		0.50	0.50			0.03			
Erodium cicutarium	0.08			0.50			0.50		
Eryngium vaseyi	18.58	10.67	0.50	8.92	1.08	0.03	17.33	11.58	0.08
Hordeum gussoneanum	47.75	2.17	3.25	44.50	3.25	0.03	21.33	0.50	4.50
Isoetes howellii		3.33							
Juncus bufonius		0.08							
Plagiobothrys stipitatus	11.00	1.08	0.42	0.55	0.08	0.03			
Psilocarphus brevissimus	14.08	0.08	1.08	8.67					
Total Absolute Cover	92.07	18.49	5.75	63.14	4.41	0.12	39.16	12.08	4.58

Pool 7	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus hordeaceus	0.63		Water						
Bromus rubens	0.25		only						
Cynodon dactylon			this						1.25
Downingia ornatissima		0.50	date						
Gratiola ebracteata						0.25			
Hemizonia fitchii									
Hordeum gussoneanum		7.21			3.71	5.67	3.00	2.67	16.75
Hordeum leporinum				0.63					
Isoetes howellii									0.04
Juncus bufonius	1.25			0.63					
Lythrum hyssopifolium						0.75	0.25		1.75
Orcuttia pilosa					4.42	0.12			11.92
Plagiobothrys stipitatus						0.04			0.08
Psilocarphus brevissimus						0.04			0.04
Total Absolute Cover	2.13	7.71	0.00	1.26	8.13	6.87	3.25	2.67	31.83

Absolute Vegetation Cover

Pool OL	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Agoseris heterophylla	0.26	zero					0.58		
Downingia bicornuta		plant						0.88	
Epilobium cleistogamum		cover				0.44			3.16
Eremocarpus seterigus		this					1.07		
Erodium cicutarium	0.22	date							
Eryngium vaseyi	23.60		0.48	16.62	5.35	1.80	24.24	8.64	2.02
Hordeum gussoneanum	17.90		8.60	23.77	6.67	10.13	0.31	2.59	11.88
Juncus bufonius					1.71		0.36		
Orcuttia inaequalis						0.22		0.57	4.08
Pectocarya penicillata	0.66				0.04				
Plagiobothrys stipitatus	7.43		16.62	1.23	5.13	5.09		11.54	1.75
Polypogon monspeliensis						0.04			
Psilocarphus brevissimus	32.98		4.47	20.79	7.50	1.80		3.25	2.54
Trifolium depauperatum	1.36								
Total Absolute Cover	84.41	0.00	30.17	62.41	26.40	19.52	26.56	27.47	25.43

Pool OR	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Agoseris heterophylla							1.50		
Downingia bicornuta								0.18	
Eleocharis macrostachya		2.59	3.08		6.21	10.49			10.49
Epilobium cleistogamum						1.16			0.94
Eremocarpus setigerus								0.68	
Erodium cicutarium	11.79			7.59			4.96		
Eryngium vaseyi	24.55	0.40	4.11	10.86	2.32	4.68	17.09	3.53	2.59
Gratiola ebracteata				0.27					
Hemizonia fitchii						0.04			
Hordeum gussoneanum	12.14	1.61	4.06	19.05	2.10	8.00		0.76	4.10
Isoetes howelli					0.27			2.90	
Juncus bufonius		3.57	0.27			0.62			0.94
Lythrum hyssopifolium						0.71		0.89	0.71
Mimulus tricolor								0.09	
Pectocarya penicillata	9.45	2.68			0.67			0.05	
Plagiobothrys nothofulvus						0.31			
Plagiobothrys stipitatus	1.12		4.79		1.34	7.59		2.28	0.09
Polypogon monspeliensis									0.04
Psilocarphus brevissimus	34.55	0.45	19.20	19.32	3.75	26.00		7.41	16.61
Sagina apetela						0.04			
Trifolium hirtum							0.86		
Vulpia myuros						0.04			
Total Absolute Cover	93.60	11.30	35.51	57.09	16.66	59.68	24.41	18.77	36.51

Table 3B. Relative Cover by Native Vernal Pool Vascular Plant Species Summary

Date	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Pool									
1A	32.95	0.00	47.65	7.21	3.97	36.64	0.00	0.00	35.91
1B	89.51	81.86	21.58	87.09	75.44	48.26	3.64	46.15	14.60
2A	76.85	0.00	0.91	66.84	14.43	0.00	0.00	0.81	0.00
2B	76.09	41.29	47.52	62.67	42.19	49.51	54.55	58.18	0.00
2C	65.11	47.50	44.82	81.45	47.62	46.27	10.99	43.10	4.89
2D	50.66	6.82	0.00	20.35	0.00	1.05	0.00	0.00	3.99
2E	40.28	8.19	91.76	76.04	42.25	69.19	0.00	51.09	94.51
3	5.87	31.64	46.69	20.07	13.68	44.18	0.00	28.47	46.94
4A	68.85	14.94	100.00	75.30	62.13	3.00	9.53	0.00	100.00
4B	48.86	34.79	37.18	60.56	67.27	63.00	2.41	41.96	74.73
4C	5.33	1.44	15.88	8.12	15.08	30.84	0.00	22.38	17.92
4D	23.30	68.31	0.00	79.34	67.00	8.72	0.00	0.00	1.63
4E	35.86	72.28	5.72	79.14	70.17	42.47	0.00	61.85	16.69
4F	16.25	71.83	0.00	1.92	70.11	48.97	0.00	61.84	0.00
4G	0.00	2.08	0.00	0.00	3.25	0.00	0.00	0.00	1.68
4I	74.74	65.95	11.53	83.53	58.61	21.97	0.00	31.31	30.00
6*	47.42	87.83	43.48	28.73	26.30	75.00	44.25	95.86	1.75
7	0.00	6.49	0.00	0.00	54.37	6.55	0.00	0.00	37.95
OL*	75.83	0.00	71.49	61.91	68.11	47.90	91.27	90.57	53.28
OR*	64.34	30.44	87.81	53.34	83.37	83.65	70.01	87.32	84.14
*Natural Pool									

Relative Cover by Native Vernal Pool Vascular Plant Species

POOL 1A	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Eleocharis macrostachya									0.17
Gratiola ebracteata									31.62
Orcuttia pilosa									0.34
Plagiobothrys stipitatus			46.08	4.50	3.38	34.52			3.59
Psilocarphus brevissimus	32.95		1.56	2.70	0.58	2.11			0.17
Relative Cover by Natives	32.95			7.20	3.96	36.63			35.89
POOL 1B	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Alopecurus saccatus						3.60			
Cicendia quadrangularis	12.43								
Deschampsia danthonioides						0.34			1.60
Downingia bicornuta				54.36	20.91	15.40			
Downingia ornatissima	34.37	17.67		8.54	1.10				
Eleocharis macrostachya		0.47	0.72			1.85			7.60
Eryngium vaseyi			0.24						
Orcuttia inaequalis	18.45			0.18					
Plagiobothrys stipitatus	18.45	59.38	13.43	21.09	48.65	21.80	3.64	46.15	
Psilocarphus brevissimus	5.83	4.34	7.19	2.90	4.70	5.22			5.40
Relative Cover by Natives	89.51	81.86	21.58	87.07	75.36	48.21	3.64	46.15	14.60
POOL 2A	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia bicornuta				16.65					
Downingia ornatissima	0.07								
Eryngium vaseyi								0.81	
Gratiola ebracteata	15.95			1.47					
Isoetes howellii	13.27								
Plagiobothrys stipitatus	24.63		0.91	30.21	14.24				
Psilocarphus brevissimus	22.92			18.50	0.19				
Relative Cover by Natives	76.85	0.00	0.91	66.84	14.43	0.00	0.00	0.81	0.00
POOL 2B	4/5/94	4/14/95	4/5/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia bicornuta				6.67	2.53	0.97		1.14	
Gratiola ebracteata	0.27	0.65		3.00	0.21				
Isoetes howellii	8.15								
Plagiobothrys stipitatus	36.96	39.00	42.84	42.67	38.40	45.55	54.55	57.04	
Psilocarphus brevissimus	30.71	1.63	4.68	10.33	1.05	2.99			
Relative Cover by Natives	76.09	41.29	47.52	62.67	42.19	49.51	54.55	58.18	0.00

Relative Cover by Native Vernal Pool Vascular Plant Species

POOL 2C	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia bicornuta				28.13	14.84			11.49	
Downingia ornatissima		2.22						1.90	
Eryngium vaseyi			0.09	2.10			10.42	3.20	4.89
Gratiola ebracteata	17.51	9.24		7.15	4.88			0.30	
Isoetes howellii	4.41								
Plagiobothrys stipitatus	19.77	33.92	42.29	18.18	24.33	45.31	0.56	22.70	
Psilocarphus brevissimus	23.43	2.12	2.44	25.88	3.57	0.96		3.50	
Relative Cover by Natives	65.11	47.50	44.82	81.45	47.62	46.27	10.98	43.10	4.89

POOL 2D	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia bicornuta				9.82					
Eryngium vaseyi						1.05			3.99
Gratiola ebracteata	11.72								
Isoetes howellii	0.99								
Plagiobothrys stipitatus	32.67	4.03		10.53					
Psilocarphus brevissimus	5.28	2.79							
Relative Cover by Natives	50.66	6.82	0.00	20.35	0.00	1.05	0.00	0.00	3.99

POOL 2E	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia bicornuta						0.10			
Downingia ornatissima						0.34			
Eleocharis macrostachya			0.55			2.98		1.94	1.21
Eryngium vaseyi			28.55			16.40		1.94	
Gratiola ebracteata	4.19	0.68	0.24	6.19	1.99	1.21			
Orcuttia inaequalis				4.31		4.94			93.30
Plagiobothrys stipitatus	8.50	7.50	50.76	14.13	32.20	38.63		32.02	
Psilocarphus brevissimus	27.59		11.65	51.41	8.05	4.60		15.19	
Relative Cover by Natives	40.28	8.18	91.76	76.05	42.24	69.19	0.00	51.09	94.51

Relative Cover by Native Vernal Pool Vascular Plant Species

POOL 3	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia bicornuta				0.23					
Downingia ornatissima								0.12	
Eleocharis macrostachya		10.53	2.76		8.75	4.52		15.09	7.59
Eryngium vaseyi									0.15
Gratiola ebracteata	0.34	0.22		3.16	4.14				
Mimulus tricolor				7.67					
Orcuttia pilosa				0.23					0.52
Plagiobothrys stipitatus	5.19	20.90	43.93	8.31		39.45		13.26	36.52
Psilocarphus brevissimus	0.34			0.47	0.79	0.22			2.16
Relative Cover by Natives	5.87	31.64	46.69	20.07	13.68	44.18	0.00	28.47	46.94
POOL 4A	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia bicornuta	0.49			1.16					
Downingia ornatissima	1.34								
Eleocharis macrostachya			0.75						
Eryngium vaseyi						0.86			100.00
Gratiola ebracteata	0.08		0.75						
Isoetes howellii							2.18		
Mimulus tricolor	12.38				2.50				
Orcuttia pilosa				37.31			7.35		
Plagiobothrys stipitatus	36.92	5.63	94.29	28.78	50.20	1.66			
Psilocarphus brevissimus	17.64	9.31	4.20	8.04	9.44	0.49			
Relative Cover by Natives	68.85	14.94	100.00	75.30	62.13	3.00	9.53	0.00	100.00
POOL 4B	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia ornatissima		2.75			0.13	0.36			
Eleocharis macrostachya		2.07	7.08		2.06	6.71			65.87
Eryngium vaseyi			0.26						0.27
Gratiola ebracteata	2.99	0.23	13.08			4.90			
Mimulus tricolor				0.28					
Orcuttia pilosa				29.73	36.34	0.12	2.41	28.56	8.33
Plagiobothrys stipitatus	31.66	25.17	13.60	18.33	21.91	49.47		13.40	
Psilocarphus brevissimus	14.22	4.57	3.15	12.23	6.82	1.44			0.27
Relative Cover of Natives	48.86	34.79	37.18	60.56	67.27	63.00	2.41	41.96	74.73

Relative Cover by Native Vernal Pool Vascular Plant Species

POOL 4C	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia ornatissima				0.26		0.21			
Gratiola ebracteata		0.19	0.13					1.92	
Orcuttia pilosa				6.34	13.37			20.13	
Plagiobothrys stipitatus	1.97	1.26	15.62		0.18	30.53		0.33	17.92
Psilocarphus brevissimus	3.36	0.00	0.13	1.52	1.53	0.10			
Relative Cover by Natives	5.33	1.45	15.88	8.12	15.08	30.84	0.00	22.38	17.92
POOL 4D	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Deschampsia danthonioides						8.72			1.63
Downingia bicornuta				1.86					
Downingia ornatissima		0.68							
Gratiola ebracteata	1.48				1.10				
Mimulus tricolor	1.11								
Orcuttia pilosa				61.57					
Plagiobothrys stipitatus	11.01	65.35		7.96	55.88				
Psilocarphus brevissimus	9.70	2.41		7.96	10.02				
Relative Cover by Natives	23.30	68.44	0.00	79.34	67.00	8.72	0.00	0.00	1.63
POOL 4E	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Deschampsia danthonioides						9.59			0.47
Eleocharis macrostachya			0.10			1.94			2.83
Gratiola ebracteata	1.33								
Orcuttia pilosa				50.61					
Plagiobothrys stipitatus	21.13	72.01	5.62	25.56	69.73	30.74		61.85	13.38
Psilocarphus brevissimus	13.40	0.30		2.96	0.44				
Relative Cover by Natives	35.86	72.31	5.72	79.14	70.17	42.27	0.00	61.85	16.69
POOL 4F	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Plagiobothrys stipitatus	13.24	71.54		1.80	69.67	45.15		61.85	
Psilocarphus brevissimus	3.02	0.30		0.13	0.44	3.82			
Relative Cover by Natives	16.26	71.84	0.00	1.93	70.11	48.97	0.00	61.85	0.00

Relative Cover by Native Vernal Pool Vascular Plant Species

POOL 4G	4/6/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Alopecurus saccatus									1.49
Downingia ornatissima		1.04							
Eleocharis macrostachya					1.62				
Gratiola ebracteata		1.04			1.62				
Psilocarphus brevissimus									0.19
Relative Cover by Natives	0.00	2.08	0.00	0.00	3.24	0.00	0.00	0.00	1.68

POOL 4I	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Cicendia quadrangularis						0.86			
Deschampsia danthonioides		0.07			2.72	2.05		31.31	5.62
Downingia bicornuta	6.57	0.07		8.00		1.42			
Downingia ornatissima	1.23	3.94		0.41		0.79			
Eleocharis macrostachya			2.54		3.69	11.64			6.94
Eryngium vaseyi	0.37		0.19			5.22			2.16
Gratiola ebracteata	4.91	2.85	1.76	0.28					
Isoetes howellii									0.08
Orcuttia pilosa				11.93	4.42				0.08
Plagiobothrys stipitatus	60.11	59.02	6.86	62.78	47.52				14.64
Psilocarphus brevissimus	1.54		0.19	0.13	0.25				0.47
Relative Cover by Natives	74.74	65.95	11.53	83.53	58.61	21.97	0.00	31.31	29.99

POOL 6	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Downingia ornatissima		3.14							
Eleocharis macrostachya		2.70	8.70			25.00			
Eryngium vaseyi	20.18	57.71	8.70	14.13	24.49	25.00	44.25	95.86	1.78
Isoetes howellii		18.01							
Plagiobothrys stipitatus	11.34	5.84	7.30	0.87	1.81	25.00			
Psilocarphus brevissimus	15.29	0.43	18.78	13.73					
Relative Cover by Natives	46.81	87.83	43.48	28.73	26.30	75.00	44.25	95.86	1.78

Relative Cover by Native Vernal Pool Vascular Plant Species

POOL 7	4/5/94	4/14/95	4/6/96		4/20/94	4/28/95	4/23/96		5/23/94	5/12/95	5/14/96
Downingia ornatissima		6.49									
Gratiola ebracteata							3.64				
Isoetes howellii											0.13
Orcuttia pilosa						54.37	1.75				37.45
Plagiobothrys stipitatus							0.58				0.25
Psilocarphus brevissimus							0.58				0.13
Relative Cover by Natives	0.00	6.49	0.00		0.00	54.37	6.55		0.00	0.00	37.95
POOL OL	4/5/94	4/14/95	4/6/96		4/20/94	4/28/95	4/23/96		5/23/94	5/12/95	5/14/96
Downingia bicornuta										3.20	
Epilobium cleistogamum							2.25				12.43
Eryngium vaseyi	27.96		1.59		26.63	20.27	9.22		91.27	31.45	7.94
Orcuttia inaequalis							1.13			2.07	16.04
Plagiobothrys stipitatus	8.80		55.09		1.97	19.43	26.08			42.01	6.88
Psilocarphus brevissimus	39.07		14.82		33.31	28.41	9.22			11.83	9.99
Relative Cover by Natives	75.83		71.49		61.91	68.11	47.90		91.27	90.57	53.28
POOL OR	4/5/94	4/14/95	4/6/96		4/20/94	4/28/95	4/23/96		5/23/94	5/12/95	5/14/96
Downingia bicornuta										0.96	
Eleocharis macrostachya		22.92	8.67			37.27	17.58				28.73
Epilobium cleistogamum							1.94				2.57
Eryngium vaseyi	26.23	3.54	11.57		19.02	13.93	7.84		70.01	18.81	7.09
Gratiola ebracteata					0.47						
Isoetes howellii						1.62				15.45	
Mimulus tricolor										0.48	
Plagiobothrys stipitatus	1.20		13.49			8.04	12.72			12.15	0.25
Psilocarphus brevissimus	36.91	3.98	54.07		33.84	22.51	43.57			39.48	45.49
Relative Cover by Natives	64.34	30.44	87.81		53.34	83.37	83.65		70.01	87.32	84.14

Table 4B. Absolute and Relative Vegetation Cover For the 1995-96 Season

Pool 1A	4/6/96	4/23/96	5/14/96	Pool 2E	4/6/96	4/23/96	5/14/96
Absolute Plant Cover	3.19	23.69	28.68	Absolute Plant Cover	16.39	41.29	22.40
Soil Absolute Cover	1.32	59.26	77.20	Soil Absolute Cover	54.95	71.31	68.81
Relative Vegetation	70.73	28.56	27.09	Relative Vegetation	22.97	36.67	24.56
Pool 1B				Pool 3			
Absolute Plant Cover	41.70	86.20	50.00	Absolute Plant Cover	39.56	55.34	52.41
Soil Absolute Cover	49.20	4.30	51.60	Soil Absolute Cover	45.70	42.66	48.83
Relative Vegetation	45.87	95.25	49.21	Relative Vegetation	46.40	56.47	51.77
Pool 2A				Pool 4A			
Absolute Plant Cover	90.95	93.91	87.31	Absolute Plant Cover	6.66	90.55	0.78
Soil Absolute Cover	11.25	1.31	1.07	Soil Absolute Cover	3.05	2.72	96.67
Relative Vegetation	88.99	98.62	98.79	Relative Vegetation	68.59	97.08	0.80
Pool 2B				Pool 4B			
Absolute Plant Cover	70.50	77.04	35.55	Absolute Plant Cover	30.80	67.32	30.00
Soil Absolute Cover	25.65	18.44	56.75	Soil Absolute Cover	56.29	22.58	62.18
Relative Vegetation	73.32	80.69	38.52	Relative Vegetation	35.37	74.88	32.55
Pool 2C				Pool 4C			
Absolute Plant Cover	66.80	73.01	48.66	Absolute Plant Cover	91.98	120.37	74.62
Soil Absolute Cover	22.73	25.52	50.46	Soil Absolute Cover	4.37	0.00	29.25
Relative Vegetation	74.61	74.10	49.09	Relative Vegetation	95.46	100.00	71.84
Pool 2D				Pool 4D			
Absolute Plant Cover	55.95	61.88	46.09	Absolute Plant Cover	0.00	84.75	51.05
Soil Absolute Cover	31.20	20.21	48.91	Soil Absolute Cover	0.00	2.50	46.55
Relative Vegetation	64.20	75.38	48.52	Relative Vegetation		97.13	52.31

Table 4B. Absolute and Relative Vegetation Cover For the 1995-96 Season

Pool 4E	4/6/96	4/23/96	5/14/96	Pool OL	4/6/96	4/23/96	5/14/96
Absolute Plant Cover	79.14	87.94	99.22	Absolute Plant Cover	30.17	19.52	25.43
Soil Absolute Cover	17.03	2.19	21.09	Soil Absolute Cover	27.37	61.80	59.17
Relative Vegetation	82.29	97.57	82.47	Relative Vegetation	52.43	24.00	30.06
Pool 4F				Pool OR			
Absolute Plant Cover	97.50	60.26	97.50	Absolute Plant Cover	35.51	59.68	36.51
Soil Absolute Cover	0.00	9.61	0.00	Soil Absolute Cover	26.12	26.39	59.06
Relative Vegetation	100.00	86.25	100.00	Relative Vegetation	57.62	69.34	38.20
Pool 4G							
Absolute Plant Cover	0.00	0.00	63.80				
Soil Absolute Cover	0.00	0.00	60.24				
Relative Vegetation			51.44				
Pool 4I							
Absolute Plant Cover	47.25	58.44	60.11				
Soil Absolute Cover	39.03	11.15	34.86				
Relative Vegetation	54.76	83.98	63.29				
Pool 6							
Absolute Plant Cover	5.75	0.12	4.58				
Soil Absolute Cover	96.25	97.08	95.50				
Relative Vegetation	5.64	0.12	4.58				
Pool 7							
Absolute Plant Cover	0.00	6.87	31.83				
Soil Absolute Cover	97.50	93.41	86.33				
Relative Vegetation	0.00	6.85	26.94				

Table 5B. Average Relative Cover of Dominant Vascular Plant Species For the 1995-96 Season

	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6	7	OL	OR
Alopecurus saccatus															0.49*					
Bromus diandrus			19.90			14.25		4.49*												
Bromus hordeaceus			2.40*			12.75*														
Bromus rubens																				
Cynodon dactylon														3.03*	1.73*			1.30*		
Deschampsia danthoniodes												3.44*				2.55*				
Downingia bicornuta		5.14*														0.47*				
Downingia ornatissima											0.06*					0.26*				
Echinochloa crus-gali	17.45																			
Eleocharis macrostachya								4.95*		26.52						7.03*	11.23			18.32
Epilobium cleistogamum																			4.14*	
Erodium cicutarium						30.03														
Eryngium vaseyi							14.98		33.60							2.52*	11.81		6.25*	
Gratiola ebracteata	10.54										0.43*							1.21*		
Hordeum gussoneanum	35.30	71.69	74.58	56.69	57.83	35.40		49.04	32.33	41.65	79.11		58.86	79.95	30.97	78.68	59.92	45.05	42.36	12.01*
Hordeum leporinum																				
Lolium multiflorum												16.86	11.39*							
Lythrum hyssopifolium														0.37*	0.06*	0.14*		5.46*		
Orcuttia inaequalis							32.74													
Orcuttia pilosa												18.41						13.06		
Plagiobothrys stipitatus	28.06	11.74		29.45	29.19		29.79	39.96	31.98	21.02	21.35		16.61	15.05		7.16*		0.27*	29.34	8.81*
Polypogon monspeliensis												27.80								
Psilocarphus brevissimus		5.93*					5.41*				0.46*			1.27*	0.06*	0.61		0.23*	11.33*	47.70
Psilocarphus tenellus														0.16*						

These average values are based on the three sample dates during the spring of 1996. Values marked with *indicate those for which a species was not present in greater than 20% relative cover for all three dates.

Table 6B. Species richness for created and nearby natural pools for the 1993-94 season.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Agoseris heterophylla						X								X	X				X	X
Alopecurus saccatus																			X	X
Amsinckia menziesii intermedia							X													
Bromus diandrus							X	X												
Bromus hordeaceus			X	X	X	X	X	X		X	X	X	X	X		X			X	X
Bromus madritensis rubens	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X				
Callitriche marginata	X		X	X	X		X					X	X			X				
Castilleja exserta															X					
Crassula connata					X	X										X	X			
Dichelostemma capitatum		X	X	X	X		X	X	X	X	X				X					
Downingia bicornuta		X	X	X	X	X	X	X	X			X				X				
Downingia ornatissima		X	X	X	X			X	X		X					X				
Echinochloa crus-galli								X			X		X			X				
Eleocharis macrostachya													X							
Eremocarpus setigerus					X	X													X	X
Erodium botrys				X								X					X			X
Erodium cicutarium	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Eryngium vaseyi					X	X	X		X	X						X	X		X	X
Gratiola ebracteata	X	X	X	X	X	X	X	X	X	X	X	X	X			X				
Hemizonia fitchii													X	X						
Hordeum marinum gussoneanum	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hordeum murinum leporinum	X	X			X		X	X	X		X	X				X	X	X	X	X
Isoetes howellii			X	X	X	X			X											
Juncus bufonius	X	X	X	X	X		X	X	X	X		X	X		X	X				
Lasthenia fremontii		X										X			X					
Leptochloa uninervia								X					X							
Lilaea scilloides								X		X		X	X							
Lupinus bicolor			X			X														
Lythrum hyssopifolium					X		X		X			X	X			X		X	X	X
Mimulus tricolor								X	X	X										
Orcuttia inaequalis	X	X	X	X	X		X	X										X		
Orcuttia pilosa								X	X	X	X	X	X			X		X		
Pectocarya pencillata																			X	X
Plagiobothrys nothofulvus						X		X												
Plagiobothrys stipitatus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
Polypogon monspeliensis												X								
Psilocarphus brevissimus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
Psilocarphus tenellus tenellus									X											
Spergularia rubra			X		X		X									X				
Trichostema lanceolatum					X															
Trifolium hirtum														X						
Trifolium depauperatum						X														
Trifolium subterraneum																	X		X	X
Trifolium variegatum																			X	X
Veronica peregrina xalapensis										X	X					X				
Vulpia microstachys myuros		X				X			X	X	X			X	X	X				

*Natural Pool

Table 7B. Species richness for created and nearby natural pools for the 1994-95 season.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Agoseris heterophylla															X					
Avena fatua								X												
Brodiaea elegans			X		X															
Bromus diandrus			X																	
Bromus hordeaceus	X	X	X					X	X		X	X			X					
Bromus madritensis rubens								X												
Callitriche marginata		X	X	X	X		X	X		X	X	X			X	X	X	X	X	X
Castilleja campestris																				X
Castilleja exserta															X					
Crassula connata					X	X									X					
Cynodon dactylon				X									X		X					
Deschampsia danthoniodes												X	X			X				
Downingia bicornuta	X	X		X	X		X			X						X	X	X	X	X
Downingia ornatissima		X			X		X	X		X					X					
Echinochloa crus-galli											X	X								
Eleocharis macrostachya		X					X	X		X			X		X	X	X	X		X
Epilobium cleistogamum																			X	X
Erodium cicutarium	X	X	X	X	X	X		X												
Eryngium vaseyi			X	X	X	X	X		X	X	X		X				X		X	X
Gratiola ebracteata		X	X		X		X	X	X	X		X			X	X		X		
Hordeum marinum gussoneanum	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hordeum murinum leporinum	X				X			X												
Isoetes howellii	X																X	X		X
Juncus bufonius										X	X	X				X	X		X	X
Lactuca serriola									X											
Lasthenia fremontii		X										X								
Lolium multiflorum	X							X	X			X	X			X				
Lythrum hyssopifolium	X	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X
Mimulus tricolor									X						X					X
Orcuttia inaequalis	X	X		X	X		X											X		
Orcuttia pilosa								X	X	X	X					X		X	X	X
Pectocarya pencillata																			X	X
Plagiobothrys stipitatus stipitatus	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Polypogon monspeliensis	X								X				X	X		X	X			
Psilocarphus brevissimus brevissimus	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Sagitaria latifolia																		X		
Trifolium hirtum									X											
Triphysaria eriantha																X				
Vulpia microstachys myuros												X								

*Natural Pool

Table 8B. Species richness for created and nearby natural pools for the 1995-96 season.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Agoseris heterophylla			X		X	X	X												X	X
Alopecurus saccatus		X						X						X	X					
Amsinckia menziesii intermedia					X															
Avena fatua				X				X		X		X								
Brodiaea elegans		X	X	X		X	X													
Bromus diandrus		X	X	X	X	X		X												
Bromus hordeaceus	X		X	X	X	X	X	X	X					X	X	X			X	
Bromus madritensis rubens	X																			
Callitriche marginata	X	X			X		X	X	X	X	X							X	X	X
Cerastium glomeratum						X														
Cicendia quadrangularis									X							X				
Crypsis schoenoides		X										X								
Cynodon dactylon		X		X										X	X			X		
Deschampsia danthonioides		X			X				X			X	X			X				
Dichelostemma capitatum			X		X															
Downingia bicornuta	X	X		X	X		X									X	X	X	X	X
Downingia ornatissima							X	X			X					X		X	X	X
Echinochloa crus-galli	X																			
Eleocharis macrostachya	X	X			X		X	X		X			X			X	X		X	X
Epilobium cleistogamum																			X	X
Erodium cicutarium	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Eryngium vaseyi			X	X	X	X	X	X	X	X	X	X				X	X		X	X
Gratiola ebracteata	X	X		X	X		X	X		X	X			X		X		X		
Hordeum marinum gussoneanum	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hordeum murinum leporinum					X	X		X												
Isoetes howellii	X		X													X		X		
Juncus bufonius															X	X		X	X	X
Lasthenia fremontii		X										X							X	X
Lilaea scilloides							X													
Lolium multiflorum				X					X		X	X	X							X
Lupinus bicolor			X			X														
Lythrum hyssopifolium				X			X	X		X	X		X	X	X	X	X	X	X	X
Mimulus tricolor																				X
Orcuttia inaequalis	X	X	X	X	X		X	X										X		
Orcuttia pilosa								X	X	X	X	X	X			X		X	X	X
Plagiobothrys nothofulvus						X														
Plagiobothrys stipitatus	X	X		X	X		X	X	X	X	X	X	X		X	X	X	X	X	X
Polypogon monspeliensis	X							X	X			X	X		X	X				
Psilocarphus brevissimus	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X		X	X
Psilocarphus tenellus tenellus														X						
Ranunculus aquatilus	X						X			X										
Saggitaria latifolia																		X		
Sagina apetala														X						X
Trichostema lanceolatum					X															
Trifolium hirtum														X						
Trifolium depauperatum						X														
Trifolium subterraneum																	X		X	X
Trifolium variegatum																			X	X
Veronica peregrina xalapensis														X			X	X		
Vulpia microstachys myuros		X			X	X														

*Natural Pool

Table 9B. Number of vernal pool endemics (VPE) found in created and nearby natural pools, OL, OR, and 6.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
1993-94	5	7	8	8	9	6	7	9	9	7	5	8	7	2	1	8	3	2	4	4
1994-95	5	9	5	6	8	3	9	7	6	9	5	6	5	0	7	8	7	10	7	11
1995-96	9	10	4	6	9	1	11	10	7	8	7	5	5	4	3	11	6	10	10	11

* Natural pools

Table 10B. Percentage of vernal pool endemics (VPE) found in created pools compared to those found in nearby natural pools, OL, OR and 6.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	7
1993-94																	
% VPE compared to pool OL	125	175	200	200	225	150	175	225	225	175	125	200	175	50	25	200	50
% VPE compared to pool OR	125	175	200	200	225	150	175	225	225	175	125	200	175	50	25	200	50
% VPE compared to pool 6	167	233	267	267	300	200	233	300	300	233	167	267	233	66.7	33.3	267	66.7
1994-95																	
% VPE compared to pool OL	71.4	129	71.4	85.7	114	42.9	129	100	85.7	129	71.4	85.7	71.4	0	100	114	143
% VPE compared to pool OR	55.6	100	55.6	66.7	88.9	33.3	100	77.8	66.7	100	55.6	66.7	55.6	0	77.8	88.9	111
% VPE compared to pool 6	71.4	129	71.4	85.7	114	42.9	129	100	85.7	129	71.4	85.7	71.4	0	100	114	143
1995-96																	
% VPE compared to pool OL	90	100	40	60	90	10	110	100	70	80	70	50	50	40	30	110	100
% VPE compared to pool OR	90	100	40	60	90	10	110	100	70	80	70	50	50	40	30	110	100
% VPE compared to pool 6	150	167	66.7	100	150	16.7	183	167	117	133	117	83.3	83.3	66.7	50	183	167

* Indicates nearby natural pools. Note, these pools were not used as a seed source for the created pools. Two of the reference pools, OL and OR, contained *Epilobium cleistogamum* during the 1994-95 and 1995-96 seasons. One reference pool, OR, contained *Castilleja campestris succulenta* during the 1994-95 season. *Epilobium cleistogamum* was not inoculated into any of the created pools, and *Castilleja campestris succulenta* was inoculated into only one created pool (Pool 1A). If these vernal pool endemics were not included, the values for created pools would be higher in many cases.

Table 11B. Native vernal pool endemic species richness for created and nearby natural pools for the 1993-94 season.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Alopecurus saccatus																			X	X
Callitriche marginata	X		X	X	X		X					X	X			X				
Downingia bicornuta		X	X	X	X	X	X	X	X			X				X				
Downingia ornatissima		X	X	X	X			X	X		X					X				
Eleocharis macrostachya													X							
Eryngium vaseyi					X	X	X		X	X						X	X		X	X
Gratiola ebracteata	X	X	X	X	X	X	X	X	X	X	X	X	X			X				
Isoetes howellii			X	X	X	X			X											
Lasthenia fremontii		X										X			X					
Lilaea scilloides								X		X		X	X							
Mimulus tricolor								X	X	X										
Orcuttia inaequalis	X	X	X	X	X		X	X										X		
Orcuttia pilosa								X	X	X	X	X	X			X		X		
Plagiobothrys stipitatus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
Psilocarphus brevissimus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X

*Natural Pool

Table 12B. Native vernal pool endemic species richness for created and nearby natural pools for the 1994-95 season.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Callitriche marginata		X	X	X	X		X	X		X	X	X			X	X	X	X	X	X
Castilleja campestris succ.																				X
Deschampsia danthoniodes												X	X			X				
Downingia bicornuta	X	X		X	X		X			X						X	X	X	X	X
Downingia ornatissima		X			X		X	X		X					X					
Eleocharis macrostachya		X					X	X		X			X		X	X	X	X		X
Epilobium cleistogamum																			X	X
Eryngium vaseyi			X	X	X	X	X		X	X	X		X				X		X	X
Gratiola ebracteata		X	X		X		X	X	X	X		X			X	X		X		
Isoetes howellii	X																X	X		X
Lasthenia fremontii		X										X								
Mimulus tricolor									X						X					X
Orcuttia inaequalis	X	X		X	X		X											X		
Orcuttia pilosa								X	X	X	X					X		X	X	X
Plagiobothrys stipitatus	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Psilocarphus brevissimus	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Sagitaria latifolia																		X		

*Natural Pool

Table 13B. Native vernal pool endemic species richness for created and nearby natural pools for the 1995-96 season.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Alopecurus saccatus		X						X						X	X					
Callitriche marginata	X	X			X		X	X	X	X	X							X	X	X
Cicendia quadrangularis									X							X				
Deschampsia danthoneoides		X			X				X			X	X			X				
Downingia bicornuta	X	X		X	X		X									X	X	X	X	X
Downingia ornatissima							X	X			X					X		X	X	X
Eleocharis macrostachya	X	X			X		X	X		X			X			X	X		X	X
Epilobium cleistogamum																			X	X
Eryngium vaseyi			X	X	X	X	X	X	X	X	X	X				X	X		X	X
Gratiola ebracteata	X	X		X	X		X	X		X	X			X		X		X		
Isoetes howellii	X		X													X		X		
Lasthenia fremontii		X										X							X	X
Lilaea scilloides							X													
Mimulus tricolor																				X
Orcuttia inaequalis	X	X	X	X	X		X	X										X		
Orcuttia pilosa								X	X	X	X	X	X			X		X	X	X
Plagiobothrys stipitatus	X	X		X	X		X	X	X	X	X	X	X		X	X	X	X	X	X
Psilocarphus brevissimus	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X		X	X
Rannuculus aquatilus	X						X			X										
Saggitaria latifolia																		X		
Veronica peregrina xalapensis														X			X	X		

*Natural Pool

Table 14B. Obligate, (Obl) and Facultative Wetland, (FacW) plant species occurring in created and natural pools for the 1993-94 season.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Alopecurus saccatus																			X	X
Callitriche marginata	X		X	X	X		X					X	X			X				
Downingia bicornuta		X	X	X	X	X	X	X	X			X				X				
Downingia ornatissima		X	X	X	X			X	X		X					X				
Echinochloa crus-gali								X			X		X			X				X
Eleocharis macrostachya													X							X
Eryngium vaseyi					X	X	X		X	X							X		X	X
Gratiola ebracteata	X	X	X	X	X	X	X	X	X	X	X	X	X			X				
Isoetes howellii			X	X	X	X			X											
Juncus bufonius	X	X	X	X	X		X	X	X	X		X	X		X	X				
Lasthenia fremontii		X										X			X					
Lilaea scilloides							X		X		X	X								
Lythrum hyssopifolium					X		X		X			X	X			X		X	X	X
Mimulus tricolor							X	X	X											
Orcuttia inaequalis	X	X	X	X	X		X	X										X		
Orcuttia pilosa								X	X	X	X	X	X			X		X		
Plagiobothrys stipitatus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
Polypogon monspeliensis												X								
Psilocarphus brevissimus	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
Veronica peregrina xalapensis										X	X					X				

*Natural Pool

Table 15B. Obligate, (Obl) and Facultative Wetland, (FacW) plant species occurring in created and natural pools for the 1994-95 season.

Pool	1A	1B	2A	2B	2C	2D	2E	3	4A	4B	4C	4D	4E	4F	4G	4I	6*	7	OL*	OR*
Species																				
Callitriche marginata		X	X	X	X		X	X		X	X	X				X	X	X	X	X
Castilleja campestris succ.																				X
Deschampsia danthoniodes												X	X			X				
Downingia bicornuta	X	X		X	X		X			X						X	X	X	X	X
Downingia ornatissima		X			X		X	X		X						X				
Echinochloa crus-gali												X	X							
Eleocharis macrostachya		X					X	X		X			X		X	X	X	X		X
Eryngium vaseyi			X	X	X	X	X		X	X	X	X	X			X	X		X	X
Gratiola ebracteata		X	X		X		X	X	X	X		X			X	X		X		
Isoetes howellii	X																X	X		X
Juncus bufonius										X	X	X				X	X		X	X
Lasthenia fremontii		X										X								
Lythrum hyssopifolium	X	X		X	X		X	X	X	X	X	X	X		X	X		X		X
Mimulus tricolor									X						X					X
Orcuttia inaequalis	X	X		X	X		X													
Orcuttia pilosa								X	X	X	X					X		X	X	X
Plagiobothrys stipitatus	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Polypogon monspeliensis	X							X				X	X		X	X				
Psilocarphus brevissimus	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Sagitaria latifolia																				

*Natural Pool

4/6/96 Diversity

Pool 2C 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
B. diandrus	15	0.009339975	-6.742365582	-0.062973527
B. rubens	2	0.00124533	-9.649256178	-0.012016508
D. capitatum	1	0.000622665	-10.64925618	-0.006630919
E. cicutarium	9	0.005603985	-7.479331176	-0.04191406
E. vaseyi	1	0.000622665	-10.64925618	-0.006630919
H. gussoneanum	837	0.52117061	-0.940172365	-0.489990205
P. stipitatus	690	0.429638854	-1.218803626	-0.523645393
P. brevissimus	49	0.030510585	-5.034546333	-0.153606955
T. depapauratum	2	0.00124533	-9.649256178	-0.012016508
sum	1606			
				-1.309424996
				H=1.31
Pool 2D 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
A. heterophylla	7	0.019390582	-5.688500105	-0.110303326
E. cicutarium	50	0.138504155	-2.851998837	-0.395013689
H. gussoneanum	304	0.842105263	-0.247927513	-0.208781064
sum	361			
				-0.714099033
				H=0.71
Pool 2E 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	6	0.0078125	-7	-0.0546875
E. cicutarium	1	0.001302083	-9.584962501	-0.01248042
E. vaseyi	45	0.05859375	-4.093109404	-0.239830629
H. gussoneanum	63	0.08203125	-3.607682577	-0.295942711
J. bufonius	1	0.001302083	-9.584962501	-0.01248042
P. stipitatus	556	0.723958333	-0.466021428	-0.337380096
P. brevissimus	95	0.123697917	-3.015106892	-0.372962441
T. depapauratum	1	0.001302083	-9.584962501	-0.01248042
sum	768			
				-1.338244638
				H=1.34

4/6/96 Diversity

Pool 3 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	74	0.041456583	-4.592254993	-0.190379199
H. gussoneanum	1060	0.593837535	-0.751859809	-0.446482576
P. stipitatus	651	0.364705882	-1.455194626	-0.53071804
sum	1785			
				-1.167579815
				H=1.17
Pool 4A 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. vaseyi	1	0.004065041	-7.942514505	-0.032286644
G. ebracteata	4	0.016260163	-5.942514505	-0.096626252
P. stipitatus	231	0.93902439	-0.090765464	-0.085230984
P. brevissimus	10	0.040650407	-4.62058641	-0.187828716
sum	246			
				-0.401972597
				H=0.40
Pool 4B 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
C. marginata	11	0.018425461	-5.762155503	-0.106170369
E. macrostachya				
E. macrostachya	50	0.083752094	-3.577730931	-0.299642457
E. vaseyi	1	0.001675042	-9.221587121	-0.015446545
G. ebracteata	145	0.242881072	-2.041678031	-0.495884949
H. gussoneanum	180	0.301507538	-1.729734025	-0.521527847
P. stipitatus	168	0.281407035	-1.829269698	-0.514769362
P. brevissimus	42	0.070351759	-3.829269698	-0.269395858
sum	597			
				-2.222839294
				H=2.22

4/6/96 Diversity

Pool 4C 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. vaseyi	1	0.00122549	-9.672425342	-0.011853462
H. gussoneanum	620	0.759803922	-0.396300937	-0.301111006
P. stipitatus	194	0.237745098	-2.0725125	-0.492729687
P. brevissimus	1	0.00122549	-9.672425342	-0.011853462
sum	816			
				-0.817547618
				H=0.82
Pool 4D 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
vegetative grass				H=0
Pool 4E 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	1	0.001113586	-9.810571635	-0.010924913
H. gussoneanum	782	0.870824053	-0.199546837	-0.173770186
L. hyssopifolium	2	0.002227171	-8.810571635	-0.019622654
P. stipitatus	113	0.125835189	-2.990392672	-0.376296628
sum	898			
				-0.580614381
				H=0.58
Pool 4F 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
vegetative grass				H=0
Pool 4G 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
C. dactylon				
				H=0

4/6/96 Diversity

Pool 4I 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	53	0.0392302	-4.671891505	-0.183279237
G. ebracteata	109	0.080680977	-3.631627635	-0.293003266
H. gussoneanum	903	0.668393782	-0.581229782	-0.388490372
P. stipitatus	281	0.207994078	-2.265385639	-0.471186798
P. brevissimus	5	0.003700962	-8.077883864	-0.029895943
sum	1351			
				-1.365855617
				H=1.37
Pool 6 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	7	0.092105263	-3.440572591	-0.316894844
H. gussoneanum	40	0.526315789	-0.925999419	-0.487368115
P. stipitatus	7	0.092105263	-3.440572591	-0.316894844
P. brevissimus	22	0.289473684	-1.788495895	-0.517722496
sum	76			
				-1.638880299
				H=1.64
Pool 7 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
flooded				
				H=0
Pool OL 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. cicutarium	2	0.004008016	-7.962896005	-0.031915415
E. vaseyi	6	0.012024048	-6.377933505	-0.076688579
H. gussoneanum	142	0.284569138	-1.813148886	-0.515966216
P. stipitatus	169	0.338677355	-1.562016569	-0.52901964
P. brevissimus	180	0.360721443	-1.471042909	-0.530636721
sum	499			
				-1.68422657
				H=1.68

4/6/96 Diversity

Pool OR 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	141	0.113709677	-3.136573053	-0.35665871
E. vaseyi	11	0.008870968	-6.816692787	-0.060470662
H. gussoneanum	140	0.112903226	-3.146841388	-0.355288544
L. hyssopifolium	19	0.015322581	-6.028196892	-0.092367533
P. stipitatus	300	0.241935484	-2.047305715	-0.495315899
P. brevissimus	629	0.507258065	-0.979208198	-0.496711255
sum	1240			
				-1.856812603
				H=1.86

4/23/96 Diversity

Pool 1A 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	138	0.182298547	-2.455625033	-0.447656875
H. gussoneanum	450	0.594451783	-0.750368299	-0.446057773
P. stipitatus	168	0.221928666	-2.171832067	-0.481991793
P. brevissimus	1	0.001321004	-9.56414949	-0.012634279
sum	757			
				-1.388340721
				H=1.39
Pool 1B 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
A. saccata	7	0.004372267	-7.83740267	-0.03426722
D. bicornuta	142	0.088694566	-3.495010473	-0.309988437
E. macrostachya	58	0.036227358	-4.786776597	-0.173412269
H. gussoneanum	1002	0.625858838	-0.676090799	-0.423137402
L. fremonti	8	0.004996877	-7.644757593	-0.038199913
P. stipitatus	304	0.189881324	-2.396830079	-0.455113269
P. monspeliensis	6	0.003747658	-8.059795092	-0.030205353
P. brevissimus	74	0.046221112	-4.435304227	-0.205004693
sum	1601			
				-1.669328556
				H=1.67
Pool 2A 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
A. heterophylla	4	0.001626016	-9.2644426	-0.015064134
B. diandrus	382	0.155284553	-2.687013772	-0.417251732
B. hordeaceous	181	0.073577236	-3.764596713	-0.27698862
E. cicutariuum	32	0.01300813	-6.2644426	-0.081488684
H. gussoneanum	1858	0.755284553	-0.404907814	-0.305820617
H. leporinum	1	0.000406504	-11.2644426	-0.004579042
S. gallica	2	0.000813008	-10.2644426	-0.008345075
sum	2460			
				-1.109537905
				H= 1.11

4/23/96 Diversity

Pool 2B 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
B. diandrus	223	0.07791754	-3.681908057	-0.286885219
B. hordeaceous	24	0.008385744	-6.897845456	-0.057843568
B. rubens	2	0.000698812	-10.48280796	-0.007325512
D. bicornuta	17	0.005939902	-7.395345115	-0.043927626
E. cicutarium	7	0.002445842	-8.675453035	-0.021218788
H. gussoneanum	1277	0.446191474	-1.164265147	-0.519485183
P. stipitatus	1246	0.435359888	-1.199719604	-0.522309793
P. brevissimus	66	0.023060797	-5.438413837	-0.125414156
sum	2862			
				-1.584409844
				H= 1.58
Pool 2C 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
A. heterophylla	3	0.001384402	-9.496520937	-0.013147006
B. diandrus	9	0.004153207	-7.911558437	-0.032858341
B. hordeaceous	7	0.003230272	-8.274128516	-0.026727688
E. cicutarium	16	0.007383479	-7.081483438	-0.052285988
E. vaseyi	1	0.000461467	-11.08148344	-0.005113744
H. gussoneanum	1057	0.487771112	-1.035723777	-0.505196138
P. stipitatus	1046	0.48269497	-1.050816302	-0.507223743
P. brevissimus	27	0.012459622	-6.326595936	-0.078826991
S. oleraceus	1	0.000461467	-11.08148344	-0.005113744
sum	2167			
				-1.226493385
				H=1.23

4/23/96 Diversity

Pool 2D 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
A. heterophylla	1	0.002941176	-8.409390936	-0.024733503
B. diandrus	47	0.138235294	-2.854802084	-0.394634406
B. hordeaceous	113	0.332352941	-1.589211974	-0.528179274
E. cicutarium	96	0.282352941	-1.824428435	-0.515132735
E. vaseyi	1	0.002941176	-8.409390936	-0.024733503
H. gussoneanum	65	0.191176471	-2.387023123	-0.456342656
H. leporinum	2	0.005882353	-7.409390936	-0.043584653
V. myuros	15	0.044117647	-4.502500341	-0.198639721
sum	339			
				-2.161248854
				H=2.18
Pool 2E 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
C. marginata	21	0.010473815	-6.577069099	-0.068887008
D. bicornuta	1	0.000498753	-10.96938652	-0.005471016
D. ornatissima	6	0.002992519	-8.384424021	-0.025090546
E. macrostachya	35	0.017456359	-5.840103504	-0.101946944
E. cicutarium	1	0.000498753	-10.96938652	-0.005471016
E. vaseyi	21	0.010473815	-6.577069099	-0.068887008
G. ebracteata	10	0.004987531	-7.647458426	-0.038141937
H. gussoneanum	360	0.179551122	-2.477533425	-0.444843907
L. hysoppifolium	22	0.010972569	-6.509954903	-0.071430927
O. pilosa	31	0.015461347	-6.015190211	-0.093002941
P. stipitatus	532	0.265336658	-1.914104086	-0.507881982
P. brevissimus	47	0.023441397	-5.41479767	-0.126930419
R. aquatilis	26	0.012967581	-6.268946803	-0.081293076
sum	2005			
				-1.639278726
				H=1.64

4/23/96 Diversity

Pool 3 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
B. diandrus	39	0.015860106	-5.978453801	-0.094818909
E. macrostachya	119	0.048393656	-4.369038256	-0.211433734
H. gussoneanum	1085	0.441236275	-1.180376692	-0.520825015
P. stipitatus	1211	0.492476617	-1.02187287	-0.503248493
P. brevissimus	5	0.002033347	-8.941927925	-0.018182041
sum	2459			
				-1.348508193
				H=1.35
Pool 4A 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
E. vaseyi	4	0.004140787	-7.915879379	-0.032777968
H. gussoneanum	885	0.916149068	-0.126345734	-0.115751526
P. stipitatus	46	0.047619048	-4.392317423	-0.209157973
P. brevissimus	31	0.032091097	-4.961683068	-0.159225854
sum	966			
				-0.516913321
				H=0.52
Pool 4B 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
C. marginata	4	0.002810963	-8.474719947	-0.023822122
D. ornatissima	8	0.005621926	-7.474719947	-0.042022319
E. macrostachya	73	0.05130007	-4.284895388	-0.219815435
G. ebracteata	50	0.035137034	-4.830863757	-0.169742226
H. gussoneanum	640	0.449754041	-1.152791852	-0.518472793
O. pilosa	4	0.002810963	-8.474719947	-0.023822122
P. stipitatus	581	0.40829234	-1.292325593	-0.527646641
P. brevissimus	63	0.044272663	-4.497440023	-0.199113648
sum	1423			
				-1.724457306
				H=1.72

4/23/96 Diversity

Pool 4C 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
D. ornatissima	6	0.003858521	-8.017736364	-0.030936603
H. gussoneanum	1302	0.837299035	-0.256185132	-0.214503564
P. stipitatus	246	0.158199357	-2.66018436	-0.420839455
P. brevissimus	1	0.000643087	-10.60269887	-0.006818456
sum	1555			
				H=0.67
Pool 4D 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	3	0.001315213	-9.570488231	-0.012587227
D. danthonioides	178	0.078035949	-3.6797173	-0.287150232
H. gussoneanum	461	0.20210434	-2.306827791	-0.466219909
L. multiflorum	577	0.252959228	-1.983023223	-0.501624024
P. stipitatus	126	0.05523893	-4.178170808	-0.230797686
P. monspeliensis	936	0.410346339	-1.285086012	-0.527330341
sum	2281			
				-2.025709419
				H=2.03
Pool 4E 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
D. danthonioides	9	0.00762066	-7.035912276	-0.053618298
E. macrostachya	37	0.031329382	-4.996339884	-0.15653224
H. gussoneanum	774	0.655376799	-0.609603493	-0.399519986
L. multiflorum	49	0.041490262	-4.591083405	-0.190485256
P. stipitatus	312	0.264182896	-1.920391031	-0.507334464
sum	1181			
				-1.307490244
				H=1.30

4/23/96 Diversity

Pool 4F 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
C. dactylon	15	0.01650165	-5.921245889	-0.097710328
G. ebracteata	5	0.00550055	-7.506208389	-0.041288275
H. gussoneanum	385	0.423542354	-1.239421849	-0.524947648
L. hysoppifolium	4	0.00440044	-7.828136484	-0.034447245
P. stipitatus	463	0.509350935	-0.973268101	-0.495735017
P. brevissimus	25	0.02750275	-5.184280294	-0.142581966
P. tenellus	11	0.01210121	-6.368704866	-0.077069036
S. apetala	1	0.00110011	-9.828136484	-0.010812031
sum	909			
				-1.424591547
				H=1.42
Pool 4G	Number	Pi	Log2Pi	PILog2Pi
H. gussoneanum	2030	1	0	0
sum	2030			
				H=0
Pool 4I	Number	Pi	Log2Pi	PiLog2Pi
C. quadrangularis	31	0.012997904	-6.265577241	-0.081439369
D. danthonioides	114	0.047798742	-4.386883537	-0.209687515
D. bicornuta	40	0.016771488	-5.897845456	-0.098915647
D. ornatissima	1	0.000419287	-11.21977355	-0.004704308
E. macrostachya	79	0.03312369	-4.915992803	-0.16283582
E. vaseyi	10	0.004192872	-7.897845456	-0.033114656
H. gussoneanum	1533	0.642767296	-0.637631569	-0.409848719
P. stipitatus	577	0.241928721	-2.047346042	-0.49531181
sum	2385			
				-1.495857844
				H=1.50

4/23/96 Diversity

Pool 6 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	2	0.222222222	-2.169925001	-0.482205556
E. vaseyi	1	0.111111111	-3.169925001	-0.352213889
H. gussoneanum	3	0.333333333	-1.584962501	-0.528320834
P. stipitatus	3	0.3333	-1.585106777	-0.528316089
sum	9			
				-1.891056367
				H=1.9
Pool 7 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
G. ebracteata	2	0.020618557	-5.599912842	-0.11546212
H. gussoneanum	77	0.793814433	-0.333126301	-0.264440466
L. hysoppifolium	11	0.113402062	-3.140481224	-0.356137046
O. pilosa	4	0.041237113	-4.599912842	-0.189687128
P. stipitatus	1	0.010309278	-6.599912842	-0.068040339
P. brevissimus	2	0.020618557	-5.599912842	-0.11546212
sum	97			
				-1.109229219
				H=1.11
Pool OL 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
E. cleistogamum	4	0.008547009	-6.87036472	-0.058721066
E. vaseyi	17	0.036324786	-4.782901878	-0.173737889
H. gussoneanum	109	0.232905983	-2.102180395	-0.489610391
O. pilosa	10	0.021367521	-5.548436625	-0.118556338
P. stipitatus	236	0.504273504	-0.98772167	-0.498081868
P. brevissimus	92	0.196581197	-2.346802764	-0.461337295
sum	468			
				-1.800044847
				H=1.80

4/23/96 Diversity

Pool OR 4/23/96	Number	Pi	Log2Pi	PiLog2Pi
E. cleistogamum	1	0.000473485	-11.04439412	-0.005229353
E. macrostachya	519	0.245738636	-2.024803391	-0.497572424
E. vaseyii	41	0.019412879	-5.686842115	-0.110397977
H. fitchii	51	0.024147727	-5.371968777	-0.129720837
H. gussoneanum	92	0.043560606	-4.520832163	-0.196930189
J. bufonius	55	0.026041667	-5.263034406	-0.137058188
L. hysoppifolium	41	0.019412879	-5.686842115	-0.110397977
P. nothofulvus	18	0.008522727	-6.874469118	-0.058589225
P. stipitatus	198	0.09375	-3.415037499	-0.320159766
P. brevissimus	1084	0.513257576	-0.962245078	-0.493879576
S. apetala	9	0.004261364	-7.874469118	-0.033555976
V. myuorus	3	0.001420455	-9.459431619	-0.013436693
sum	2112			
				-2.10692818
				H=2.11

5/14/96 Diversity

Pool 1A 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	20	0.026845638	-5.21916852	-0.140111907
H. gussoneanum	707	0.948993289	-0.075530211	-0.071677663
O. pilosa	2	0.002684564	-8.541096615	-0.022929118
P. stipitatus	13	0.017449664	-5.840656897	-0.101917503
P. monspeliensis	3	0.004026846	-7.956134115	-0.032038124
sum	745			
				-0.368674315
				H=0.37
Pool 1B 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
D. danthonioides	19	0.016799293	-5.895455701	-0.099039486
E. macrostachya	58	0.051282051	-4.285402219	-0.219764216
H. gussoneanum	970	0.857648099	-0.221542277	-0.190005313
P. brevissimus	84	0.074270557	-3.751065791	-0.278593746
sum	1131			
				-0.78740276
				H=0.79
Pool 2A 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
B. diandrus	438	0.262432594	-1.92998118	-0.506489968
B. hordeaceous	36	0.021569802	-5.534843238	-0.119385474
H. gussoneanum	1195	0.715997603	-0.481973336	-0.345091754
sum	1669			
				-0.970967196
				H=0.97
Pool 2B 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
C. dactylon	1	0.000814996	-10.26091953	-0.008362608
E. cicutarium	198	0.161369193	-2.631562914	-0.424653184
H. gussoneanum	1028	0.837815811	-0.255294984	-0.213890174
sum	1227			
				-0.646905966
				H=0.65

5/14/96 Diversity

Pool 2C 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
B. diandrus	19	0.015079365	-6.051280505	-0.091249468
B. hordeaceous	2	0.001587302	-9.299208018	-0.014760648
E. vaseyi	5	0.003968254	-7.977279923	-0.031655873
H. gussoneanum	1164	0.923809524	-0.114332675	-0.105621614
H. leporinum	70	0.055555556	-4.169925001	-0.2316625
sum	1260			
				-0.474950103
				H=0.47
Pool 2D 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
B. diandrus	158	0.463343109	-1.109847181	-0.514240043
B. hordeaceous	57	0.167155425	-2.580737915	-0.431384344
E. cicutarium	25	0.073313783	-3.769771739	-0.276376227
E. vaseyi	4	0.011730205	-6.413627929	-0.075233172
H. gussoneanum	96	0.281524927	-1.828665428	-0.514814901
H. leporinum	1	0.002932551	-8.413627929	-0.024673396
sum	341			
				-1.836722082
				H=1.84
Pool 2E 5/14/96	Number	Pi	Log2PI	PiLog2Pi
E. macrostachya	18	0.035019455	-4.835699548	-0.169343564
H. gussoneanum	39	0.075875486	-3.72022233	-0.282273679
O. pilosa	457	0.889105058	-0.169574194	-0.150769274
sum	514			
				-0.602386516
				H=0.60

5/14/96 Diversity

Pool 3 5/14/96		Pi	Log2Pi	PiLog2Pi
B. hordeaceous	32	0.015481374	-6.013322673	-0.093094497
E. macrostachya	145	0.070149976	-3.833413583	-0.26891387
E. vaseyi	2	0.000967586	-10.01332267	-0.00968875
H. gussoneanum	968	0.468311563	-1.094459436	-0.512548009
O. pilosa	2	0.000967586	-10.01332267	-0.00968875
P. stipitatus	891	0.431059507	-1.214041052	-0.523323937
P. monspeliensis	23	0.011127238	-6.489760717	-0.072213109
P. brevissimus	4	0.001935172	-9.013322673	-0.017442327
sum	2067			
				-1.506913248
				H=1.50
Pool 4A 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
E. vaseyi	4	1	0	0
sum	4			
				0
				H=0
Pool 4B 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	210	0.53030303	-0.915111102	-0.485286191
E. vaseyi	1	0.002525253	-8.62935662	-0.021791305
H. gussoneanum	166	0.419191919	-1.254317189	-0.52579963
O. pilosa	12	0.03030303	-5.044394119	-0.152860428
P. brevissimus	7	0.017676768	-5.822001698	-0.102914171
sum	396			
				-1.288651724
				H=1.29
Pool 4C 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	573	0.893915757	-0.161789218	-0.144625931
P. stipitatus	68	0.106084243	-3.236717705	-0.343364749
sum	641			
				-0.48799068
				H=0.49

5/14/96 Diversity

Pool 4D 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
D. danthonioides	8	0.018306636	-5.77148947	-0.105656558
H. gussoneanum	266	0.608695652	-0.716207034	-0.435952108
L. multiflorum	44	0.100686499	-3.312057851	-0.333479509
P. monspeliensis	119	0.272311213	-1.876671706	-0.511038748
sum	437			
				-1.386126923
				H=1.39
Pool 4E 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
D. danthonioides	10	0.014727541	-6.085339669	-0.089622086
D. ornatissima	13	0.019145803	-5.706828046	-0.109261804
H. gussoneanum	558	0.82179676	-0.283146452	-0.232688837
L. multiflorum	98	0.144329897	-2.79255792	-0.403049597
sum	679			
				-0.834622324
				H=0.83
Pool 4F 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	1560	1	0	0
				H=0
Pool 4G 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
C. dactylon	100	1	0	0
				H=0

5/14/96 Diversity

Pool 4I 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
D. danthonioides	38	0.024484536	-5.351985329	-0.131040878
E. macrostachya	29	0.018685567	-5.741931847	-0.107291252
E. vaseyi	5	0.003221649	-8.277984747	-0.026668765
H. gussoneanum	1338	0.862113402	-0.214050442	-0.184535754
J. bufonius	10	0.006443299	-7.277984747	-0.046894232
L. hyssopifolium	8	0.005154639	-7.599912842	-0.039174808
O. pilosa	3	0.00193299	-9.014950341	-0.017425806
P. monspeliensis	90	0.057989691	-4.108059746	-0.238225114
P. brevissimus	29	0.018685567	-5.741931847	-0.107291252
T. hirtum	2	0.00128866	-9.599912842	-0.012371022
sum	1552			
				-0.910918884
				H=0.91
Pool 6 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
E. vaseyi	1	0.025	-5.321928095	-0.133048202
H. gussoneanum	39	0.975	-0.036525876	-0.035612729
sum	40			
				-0.168660931
				H=0.17
Pool 7 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
C. dactylon	1	0.006756757	-7.209453366	-0.048712523
D. ornatissima	1	0.006756757	-7.209453366	-0.048712523
H. gussoneanum	102	0.689189189	-0.537028024	-0.370113908
I. howelli	10	0.067567568	-3.887525271	-0.262670626
L. hyssopifolium	17	0.114864865	-3.121990524	-0.35860702
O. pilosa	17	0.114864865	-3.121990524	-0.35860702
sum	148			
				-1.447423619
				H=1.45

5/14/96 Diversity

Pool OL 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
E. cleistogamum	58	0.138095238	-2.856264523	-0.394436529
E. vaseyi	20	0.047619048	-4.392317423	-0.209157973
H. gussoneanum	120	0.285714286	-1.807354922	-0.516387121
O. pilosa	39	0.092857143	-3.428843299	-0.318392592
P. stipitatus	58	0.138095238	-2.856264523	-0.394436529
P. brevissimus	125	0.297619048	-1.748461233	-0.520375367
sum	420			
				-2.353186111
				H=2.35
Pool OR 5/14/96	Number	Pi	Log2Pi	PiLog2Pi
E. cleistogamum	32	0.027327071	-5.193525361	-0.141923836
D. ornatissima	12	0.010247652	-6.60856286	-0.06772225
E. macrostachya	339	0.289496157	-1.788383897	-0.517730266
E. vaseyi	32	0.027327071	-5.193525361	-0.141923836
H. gussoneanum	128	0.109308284	-3.193525361	-0.349078776
J. bufonius	23	0.019641332	-5.669963404	-0.111365635
L. hyssopifolium	26	0.022203245	-5.493085642	-0.121964327
P. stipitatus	3	0.002561913	-8.60856286	-0.022054388
P. brevissimus	576	0.491887276	-1.023600359	-0.503495992
sum	1171			
				-1.977259304
				H=1.98

Table 2B. Absolute Vegetation Cover Summary

	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Pool 1A	0.88	6.38	3.19	1.11	8.57	23.69	1.91	7.05	28.68
Pool 1B	51.50	64.50	41.70	55.00	63.10	86.20	5.50	50.70	50.00
Pool 2A	80.23	6.38	90.95	82.75	64.40	93.91	0.00	44.53	87.31
Pool 2B	18.40	45.90	70.50	30.00	47.40	77.04	9.35	35.15	35.55
Pool 2C	15.88	52.27	66.80	33.27	61.93	73.01	10.65	39.95	48.66
Pool 2D	65.87	70.23	55.95	32.39	97.50	61.88	0.00	0.00	46.09
Pool 2E	8.59	7.33	16.39	7.43	13.54	41.29	8.55	16.46	22.40
Pool 3	11.76	18.52	39.56	17.09	15.20	55.34	9.47	34.46	52.41
Pool 4A	79.01	24.49	6.66	67.00	57.65	90.55	15.11	51.22	0.78
Pool 4B	35.16	35.24	30.80	29.03	62.57	67.32	9.97	36.13	30.00
Pool 4C	44.63	70.02	91.98	49.39	73.89	120.37	29.25	39.14	74.62
Pool 4D	29.78	48.56	0.00	53.78	51.00	84.75	7.89	10.67	51.05
Pool 4E	41.41	76.09	79.14	58.05	88.28	87.94	9.14	81.10	99.22
Pool 4F	82.79	76.56	97.50	79.91	88.36	60.26	91.73	81.10	97.50
Pool 4G	53.09	11.54	0.00	61.79	7.39	0.00	4.64	17.51	63.80
Pool 4I	75.33	72.87	47.25	68.29	76.39	58.44	0.97	11.53	60.11
Pool 6*	92.07	18.49	5.75	63.14	4.41	0.12	39.16	12.08	4.58
Pool 7	2.13	7.71	0.00	1.26	8.13	6.87	3.25	2.67	31.83
Pool OL*	84.41	0.00	30.17	62.41	26.40	19.52	26.56	27.47	25.43
Pool OR*	93.60	11.30	35.51	57.09	16.66	59.68	24.41	18.77	36.51
*Natural Pool									

Absolute Vegetation Cover

Pool 1A	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus diandrus						0.20			
Bromus hordeaceus		0.59			0.29	3.00		0.29	0.59
Bromus rubens	0.59								
Echinochloa crus-gali			1.67						
Eleocharis macrostachya									0.05
Erodium cicutarium		0.05						0.29	
Gratiola ebracteata									9.07
Hordeum gussoneanum		5.74			7.65	11.81	1.91	6.47	16.08
Hordeum leporinum				1.03	0.29				
Orcuttia pilosa									0.10
Plagiobothrys stipitatus			1.47	0.05	0.29	8.18			1.03
Polypogon monspeliensis									1.71
Psilocarphus brevissimus	0.29		0.05	0.03	0.05	0.50			0.05
Total Absolute Cover	0.88	6.38	3.19	1.11	8.57	23.69	1.91	7.05	28.68
Pool 1B	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Alopecurus saccatus						3.10			
Bromus hordeaceus		2.50							
Bromus rubens	6.40			0.60					
Cicendia quadrangularis									
Deschampsia danthonioides						0.30			0.80
Dichelostemma capitatum	4.00								
Downingia bicornuta				29.90	13.20	13.30			
Downingia ornatissima	17.70	11.40		4.70	0.70				
Eleocharis macrostachya		0.30	0.30			1.60			3.80
Erodium cicutarium	1.30	0.10		2.70			3.90		
Eryngium vaseyi			0.10						
Hordeum gussoneanum		9.10	32.70	3.60	15.50	44.20	1.40	27.30	42.70
Hordeum leporinum				0.20					
Juncus bufonius	0.10								
Lasthenia fremontii						0.30			
Orcuttia inaequalis	9.50			0.10					
Plagiobothrys stipitatus	9.50	38.30	5.60	11.60	30.70	18.80	0.20	23.40	
Polypogon monspeliensis						0.10			
Psilocarphus brevissimus	3.00	2.80	3.00	1.60	3.00	4.50			2.70
Total Absolute Cover	51.50	64.50	41.70	55.00	63.10	86.20	5.50	50.70	50.00

Absolute Vegetation Cover

Pool 2A	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Agoseris heterophylla						1.07	zero		
Bromus diandrus			2.80			20.11	plant		30.77
Bromus hordeaceus		0.59		2.99		5.77	cover		0.95
Dichelostemma capitatum	1.49		0.06				this		
Downingia bicornuta				13.78			date		
Downingia ornatissima	0.06								
Erodium cicutarium	15.83	0.05	0.95	13.66		4.52			
Eryngium vaseyi								0.36	
Gratiola ebracteata	12.80			1.22					
Hordeum gussoneanum	1.19	5.74	86.19		54.82	61.37		44.17	55.59
Hordeum leporinum					0.29	0.36			
Isoetes howellii	10.65								
Juncus bufonius				10.79					
Lupinus bicolor	0.06								
Plagiobothrys stipitatus	19.76		0.83	25.00	9.17				
Psilocarphus brevissimus	18.39			15.31	0.12				
Silene gallica						0.71			
Trifolium depauperatum			0.12						
Total Absolute Cover	80.23	6.38	90.95	82.75	64.40	93.91	0.00	44.53	87.31

Pool 2B	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus diandrus						6.35			7.80
Bromus hordeaceus		0.30		1.35	4.50	0.01			
Bromus rubens	2.75					0.01			
Cynodon dactylon			0.40						0.05
Dichelostemma capitatum	0.30								
Downingia bicornuta				2.00	1.20	0.75		0.40	
Erodium cicutarium	1.35	12.20	0.05	2.35		0.69	0.05	0.05	0.35
Gratiola ebracteata	0.05	0.30		3.90	0.10				
Hordeum gussoneanum		14.45	36.55	2.35	22.90	31.84	4.20	14.65	27.35
Isoetes howellii	1.50								
Juncus bufonius				2.15					
Plagiobothrys stipitatus	6.80	17.90	30.20	12.80	18.20	35.09	5.10	20.05	
Psilocarphus brevissimus	5.65	0.75	3.30	3.10	0.50	2.30			
Total Absolute Cover	18.40	45.90	70.50	30.00	47.40	77.04	9.35	35.15	35.55

Absolute Vegetation Cover

Pool 2C	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Agoseris heterophylla						0.41			
Bromus diandrus			1.45			0.46			1.57
Bromus hordeaceus	5.47								0.06
Dichelostemma capitatum	0.06								
Downingia bicornuta				9.36	9.19			4.59	
Downingia ornatissima		1.16						0.76	
Eremocarpus setigerus							0.35		
Erodium cicutarium		4.36	5.70		0.35	2.32			
Eryngium vaseyi			0.06	0.70			1.11	1.28	2.38
Gratiola ebracteata	2.79	4.83		2.38	3.02			0.12	
Hordeum gussoneanum		23.08	29.59	0.06	20.23	35.46	8.78	20.81	39.24
Hordeum leporinum				4.42	11.34				5.41
Isoetes howellii	0.70								
Juncus bufonius				1.63					
Lythrum hyssopifolium							0.35		
Orcuttia inaequalis				0.06	0.52			1.92	
Plagiobothrys stipitatus	3.14	17.73	28.25	6.05	15.07	33.08	0.06	9.07	
Psilocarphus brevissimus	3.72	1.11	1.63	8.61	2.21	0.70		1.40	
Sonchus oleraceus						0.58			
Trifolium depauperatum			0.12						
Total Absolute Cover	15.88	52.27	66.80	33.27	61.93	73.01	10.65	39.95	48.66
Pool 2D	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Agoseris heterophylla			0.65			0.17	zero	zero	
Bromus diandrus						7.82	plant	plant	19.67
Bromus hordeaceus	0.65			17.50		14.34	cover	cover	6.96
Bromus rubens	10.00						this	this	
Crassula connata	4.24	8.59					date	date	
Downingia bicornuta				3.18					
Erodium cicutarium	14.24	56.85	12.80	7.05	97.50	32.71			6.63
Eryngium vaseyi						0.65			1.84
Gratiola ebracteata	7.72								
Hordeum gussoneanum			42.50	1.25		4.02			10.98
Hordeum leporinum						1.63			0.01
Isoetes howellii	0.65								
Lupinus bicolor	3.37								
Plagiobothrys stipitatus	21.52	2.83		3.41					
Psilocarphus brevissimus	3.48	1.96							
Vulpia myuros						0.54			
Total Absolute Cover	65.87	70.23	55.95	32.39	97.50	61.88	0.00	0.00	46.09

Absolute Vegetation Cover

Pool 2E	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus rubens	4.86								
Crassula connata				0.96					
Dichelostemma capitatum	0.27								
Downingia bicornuta						0.04			
Downingia ornatissima						0.14			
Eleocharis macrostachya			0.09			1.23		0.32	0.27
Erodium cicutarium			0.04			0.27			
Eryngium vaseyi			4.68			6.77		0.32	
Gratiola ebracteata	0.36	0.05	0.04	0.46	0.27	0.50			
Hordeum gussoneanum		6.46	0.59	0.27	7.82	12.04	8.23	8.05	1.23
Juncus bufonius			0.04	0.55					
Lythrum hyssopifolium						0.41	0.32		
Orcuttia inaequalis				0.32		2.04			20.90
Plagiobothrys stipitatus	0.73	0.55	8.32	1.05	4.36	15.95		5.27	
Polypogon monspeliensis		0.27							
Psilocarphus brevissimus	2.37		1.91	3.82	1.09	1.90		2.50	
Trifolium depauperatum			0.68						
Total Absolute Cover	8.59	7.33	16.39	7.43	13.54	41.29	8.55	16.46	22.40

Pool 3	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Avena fatua		0.59							
Bromus diandrus		1.21				3.63			3.63
Bromus hordeaceus	2.05	1.06		2.89	1.76		5.08		0.82
Bromus rubens	4.32				1.17				
Downingia bicornuta				0.04					
Downingia ornatissima								0.04	
Eleocharis macrostachya		1.95	1.09		1.33	2.50		5.20	3.98
Erodium cicutarium				0.81					
Eryngium vaseyi									0.08
Gratiola ebracteata	0.04	0.04		0.54	0.63				
Hordeum gussoneanum		8.63	21.09		7.85	27.26	4.09	24.61	23.36
Hordeum leporinum		1.17		5.77	2.34		0.30		
Juncus bufonius	4.70			4.19					
Lythrum hyssopifolium								0.04	
Mimulus tricolor				1.31					
Orcuttia pilosa				0.04					0.27
Plagiobothrys stipitatus	0.61	3.87	17.38	1.42		21.83		4.57	19.14
Psilocarphus brevissimus	0.04			0.08	0.12	0.12			1.13
Total Absolute Cover	11.76	18.52	39.56	17.09	15.20	55.34	9.47	34.46	52.41

Absolute Vegetation Cover

Pool 4A	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus rubens	17.44								
Downingia bicornuta	0.39			0.78					
Downingia ornatissima	1.06								
Eleocharis macrostachya			0.05						
Eryngium vaseyi						0.78			0.78
Gratiola ebracteata	0.06		0.05						
Hordeum gussoneanum		20.83		8.50	21.83	87.83	12.72	51.22	
Hordeum leporinum				2.83					
Isoetes howellii							0.33		
Juncus bufonius	7.17			5.22			0.33		
Lythrum hyssopifolium							0.62		
Mimulus tricolor	9.78				1.44				
Orcuttia pilosa				25.00			1.11		
Plagiobothrys stipitatus	29.17	1.38	6.28	19.28	28.94	1.50			
Psilocarphus brevissimus	13.94	2.28	0.28	5.39	5.44	0.44			
Total Absolute Cover	79.01	24.49	6.66	67.00	57.65	90.55	15.11	51.22	0.78

Pool 4B	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus hordeaceus							0.13		
Bromus rubens	12.82			0.48					
Dichelostemma capitatum	0.48								
Downingia ornatissima		0.97			0.08	0.24			
Eleocharis macrostachya		0.73	2.18		1.29	4.52			19.76
Erodium cicutarium	0.48								
Eryngium vaseyi			0.08						0.08
Gratiola ebracteata	1.05	0.08	4.03			3.30			
Hordeum gussoneanum		22.50	19.35	10.40	18.79	24.83	9.60	20.97	7.58
Juncus bufonius	0.97			0.57	1.69				
Lythrum hyssopifolium						0.08			
Mimulus tricolor				0.08					
Orcuttia pilosa				8.63	22.74	0.08	0.24	10.32	2.50
Plagiobothrys stipitatus	11.13	8.87	4.19	5.32	13.71	33.30		4.84	
Psilocarphus brevissimus	5.00	1.61	0.97	3.55	4.27	0.97			0.08
Trifolium hirtum		0.48							
Vulpia myuros	3.23								
Total Absolute Cover	35.16	35.24	30.80	29.03	62.57	67.32	9.97	36.13	30.00

Absolute Vegetation Cover

Pool 4C	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus hordeaceus		9.25							
Bromus rubens	13.50								
Downingia ornatissima				0.13		0.25			
Erodium cicutarium	1.50								
Gratiola ebracteata		0.13	0.12					0.75	
Hordeum gussoneanum	27.25	56.63	77.37	41.63	62.75	83.25	29.25	29.63	61.25
Hordeum leporinum				0.75					
Lythrum hyssopifolium								0.75	
Orcuttia pilosa				3.13	9.88			7.88	
Plagiobothrys stipitatus	0.88	0.88	14.37		0.13	36.75		0.13	13.37
Psilocarphus brevissimus	1.50		0.12	0.75	1.13	0.12			
Vulpia myuros		3.13		3.00					
Total Absolute Cover	44.63	70.02	91.98	49.39	73.89	120.37	29.25	39.14	74.62

Pool 4D	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus hordeaceus			zero			0.33			
Bromus rubens	3.17		plant						
Deschampsia danthonioides			cover			7.39			0.83
Downingia bicornuta			this	1.00					
Downingia ornatissima		0.33	date						
Echinochloa crus-gali		1.72							
Erodium cicutarium	6.50			2.50			2.72		
Gratiola ebracteata	0.44				0.56				
Hordeum gussoneanum	10.67	13.67		3.33	16.83	18.78	5.17	6.50	16.89
Hordeum leporinum	2.50			2.50					
Juncus bufonius				2.17					
Lolium perrene						25.36			10.55
Marselia vestita								4.17	
Mimulus tricolor	0.33								
Orcuttia pilosa				33.11					
Plagiobothrys stipitatus	3.28	31.67		4.89	28.50				
Polypogon monspeliensis						32.89			22.78
Psilocarphus brevissimus	2.89	1.17		4.28	5.11				
Total Absolute Cover	29.78	48.56	0.00	53.78	51.00	84.75	7.89	10.67	51.05

Absolute Vegetation Cover

Pool 4E	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Bromus rubens	24.61			0.08					
Deschampsia danthonioides						8.43			0.47
Eleocharis macrostachya			0.08			1.71			2.81
Gratiola ebracteata	0.55								
Hordeum gussoneanum		21.09	74.45	12.03	26.33	36.71	9.14	30.94	40.47
Juncus bufonius	1.95								
Lolium perrene						14.06			18.05
Lythrum hyssopifolium			0.16						
Orcuttia pilosa				29.38					
Plagiobothrys stipitatus	8.75	54.77	4.45	14.84	61.56	27.03		50.16	13.28
Polypogon monspeliensis									24.14
Psilocarphus brevissimus	5.55	0.23		1.72	0.39				
Total Absolute Cover	41.41	76.09	79.14	58.05	88.28	87.94	9.14	81.10	99.22

Pool 4F	4/5/94	4/14/95	4/6/96	4/20/94	4/28/95	4/23/96	5/23/94	5/12/95	5/14/96
Agoseris heterophylla							3.75		
Bromus hordeaceus	13.46			2.89					
Bromus rubens	13.85								
Cynodon dactylon						5.48			
Eleocharis macrostachya		0.47			0.08				
Erodium cicutarium	34.04								
Hordeum gussoneanum		21.09	97.50	75.48	26.33	24.03	87.40	30.94	97.50
Hordeum leporinum	1.44								
Juncus bufonius						0.19			
Lythrum hyssopifolium						0.67			
Plagiobothrys stipitatus	10.96	54.77		1.44	61.56	27.21		50.16	
Psilocarphus brevissimus	2.50	0.23		0.10	0.39	2.30			
Psilocarphus tenellus						0.29			
Sagina apetela						0.09			
Trifolium hirtum							0.58		
Vulpia myuros	6.54								
Total Absolute Cover	82.79	76.56	97.50	79.91	88.36	60.26	91.73	81.10	97.50

Photograph 4. *Orcuttia inaequalis* in created pool 3.

Photograph 5. *Orcuttia pilosa* in created pool 4B.

Photograph 6. Ringing or zonation occurs as created vernal pool 2C dries.

Photograph 7. Site 1A, Spring 1994. Note trampling and grazing impacts on the unfenced side of this first year pool.

Photograph 8. Site 1A, Spring 1996. Note increased establishment of herbs and grasses on both the grazed and ungrazed sides.

Photograph 9. Site 4, Spring 1996. Note widespread establishment of nonnative grasses in this series of created swale-like pools.

Photograph 10. Aerial view created pool 2E. Note that the permanent sampling transect extends into the outer zone of vegetation well beyond the area of inundation.

Photograph 11. Natural pool - OR. Supports *Orcuttia pilosa.*

Photograph 12 . Created pool 2E, 1996. Note vigorous stand of *Orcuttia inaequalis* with *Eryngium vaseyi* in background.

APPENDIX B

VEGETATION DATA

Table 1B. Pool Diversity Summary

Pool	4/14/95	4/6/96	4/28/95	4/23/96	5/12/95	5/14/96
1a	0.60	0.56	0.23	1.39	0.47	0.37
1B	1.84	1.00	1.75	1.67	0.96	0.79
2A	2.16	0.48	0.50	1.11	0.01	0.97
2B	1.81	0.84	1.60	1.58	1.23	0.65
2C	1.70	1.31	1.66	1.23	2.22	0.47
2D	1.29	0.71	0.00	2.18	0.00	1.84
2E	1.24	1.34	1.46	1.64	1.81	0.60
3	2.40	1.17	2.32	1.35	1.57	1.50
4A	0.79	0.40	1.42	0.42	0.01	0.00
4B	1.43	2.22	2.02	1.72	1.31	1.29
4C	0.43	0.82	0.39	0.67	0.77	0.49
4D	1.68	0.00	1.46	2.03	0.00	1.39
4E	0.87	0.58	0.90	1.30	0.80	0.83
4F	0.00	0.00	0.00	1.42	0.00	0.00
4G	2.13	0.00	0.84	0.00	0.00	0.00
4I	1.48	1.37	1.38	1.50	0.98	0.91
6*	1.78	1.64	1.26	1.90	0.74	0.17
7	0.27	0.00	1.00	1.11	0.00	1.45
OL*	0.00	1.86	1.46	1.80	1.84	2.35
OR*	2.19	1.68	2.15	2.11	2.03	1.98
*Natural Pool						

4/14/95 Diversity

Pool 1A 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	7	0.041916168	-4.57634937	-0.191823028
E. cicutarium	1	0.005988024	-7.383704292	-0.044213798
H. gussoneanum	150	0.898203593	-0.154885602	-0.139118804
V. peregrina	9	0.053892216	-4.213779291	-0.227089902
sum	167			
				-0.602245532
				H=0.60
Pool 1B 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	20	0.040816327	-4.614709844	-0.188355504
D. ornatissima	82	0.167346939	-2.579085934	-0.431602136
E. macrostachya	3	0.006122449	-7.351675438	-0.045010258
G. ebracteata	1	0.002040816	-8.936637939	-0.018238037
H. gusssoneanum	91	0.185714286	-2.428843299	-0.451070898
P. stipatatus	267	0.544897959	-0.875942007	-0.477299012
P. brevissimus	26	0.053061224	-4.236198221	-0.224777865
sum	490			
				-1.836353709
				H=1.84
Pool 2A 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
B. diandrus	76	0.113943028	-3.133615438	-0.357053633
B. hordeaceous	88	0.131934033	-2.922111333	-0.385525933
E. cicutarium	37	0.055472264	-4.172089586	-0.231435254
G. ebracteata	1	0.00149925	-9.381542951	-0.014065282
H. gussoneanum	213	0.31934033	-1.646833331	-0.525900299
P. stipitatus	238	0.356821589	-1.486725188	-0.530495644
P. brevissimus	14	0.020989505	-5.574188029	-0.116999449
sum	667			
				-2.161475494
				H=2.16

4/14/95 Diversity

Pool 2B 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	49	0.060419236	-4.04884826	-0.244628317
E. cicutarium	134	0.165228113	-2.597468914	-0.429174888
G. ebracteata	2	0.002466091	-8.663558104	-0.021365125
H. gussoneanum	365	0.450061652	-1.15180545	-0.518383464
P. stipitatus	251	0.309494451	-1.69201455	-0.523669115
P. brevissimus	10	0.012330456	-6.341630009	-0.078195191
sum	811			
				-1.8154161
				H=1.81
Pool 2C 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
D. ornatissima	19	0.021714286	-5.525211693	-0.119976025
E. cicutarium	62	0.070857143	-3.818942896	-0.270599382
G. ebracteata	62	0.070857143	-3.818942896	-0.270599382
H. gussoneanum	518	0.592	-0.756330919	-0.447747904
P. stipitatus	197	0.225142857	-2.151087387	-0.48430196
P. brevissimus	17	0.019428571	-5.685676365	-0.110464569
sum	875			
				-1.703689224
				H=1.70
Pool 2D 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
C. aquatica	298	0.706161137	-0.501930668	-0.354443932
E. cicutarium	69	0.163507109	-2.612574732	-0.427174541
P. stipitatus	30	0.071090047	-3.814208593	-0.27115227
P. brevissimus	25	0.059241706	-4.077242999	-0.241542832
sum	422			
				-1.294313574
				H=1.29

4/14/95 Diversity

Pool 2E 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
G. ebracteata	2	0.023809524	-5.392317423	-0.12838851
H. gussoneanum	60	0.714285714	-0.485426827	-0.346733448
P. stipitatus	11	0.130952381	-2.932885804	-0.384068379
P. brevissimus	11	0.130952381	-2.932885804	-0.384068379
sum	84			
				-1.243258716
				H=1.24
Pool 3 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
A. fatua	20	0.038535645	-4.697662633	-0.181027462
B. diandrus	32	0.061657033	-4.019590728	-0.247836037
B. hordeaceous	29	0.055876686	-4.161609733	-0.23253696
E. macrostachya	49	0.094412331	-3.404880884	-0.321462742
E. cicutarium	38	0.073217726	-3.771663215	-0.276152605
G. ebracteata	1	0.001926782	-9.019590728	-0.017378788
H. leporinum	27	0.052023121	-4.264703226	-0.221863174
H. gussoneanum	222	0.427745665	-1.225174862	-0.524063236
P. stipitatus	49	0.094412331	-3.404880884	-0.321462742
T. hirtum	5	0.009633911	-6.697662633	-0.064524688
sum	472			
				-2.408308434
				H=2.72
Pool 4A 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
D. ornatissima	1	0.000581058	-10.74903138	-0.006245806
G. ebracteata	3	0.001743173	-9.164068881	-0.015974554
H. gussoneanum	253	0.147007554	-2.766037807	-0.406628452
P. stipitatus	1420	0.825101685	-0.277356168	-0.228847041
P. brevissimus	44	0.025566531	-5.289599763	-0.135236717
sum	1721			
				-0.792932569
				H=0.79

4/14/95 Diversity

Pool 4B 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	4	0.006504065	-7.2644426	-0.047248407
D. ornatissima	10	0.016260163	-5.942514505	-0.096626252
E. macrostachya	17	0.027642276	-5.176979759	-0.143103506
G. ebracteata	2	0.003252033	-8.2644426	-0.026876236
H. gussoneanum	422	0.686178862	-0.543343412	-0.372830764
P. stipitatus	118	0.191869919	-2.381799551	-0.456995686
P. brevissimus	39	0.063414634	-3.979040381	-0.25232939
T. hirtum	3	0.004878049	-7.6794801	-0.037460879
sum	615			
				-1.433471119
				H=1.43
Pool 4C 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	9	0.01433121	-6.124695747	-0.087774302
G. ebracteata	1	0.001592357	-9.294620749	-0.014800352
H. gussoneanum	588	0.936305732	-0.094948404	-0.088900735
P. stipitatus	4	0.006369427	-7.294620749	-0.046462553
V. myuros	26	0.041401274	-4.594181031	-0.190204947
sum	628			
				-0.428142888
				H=0.43
Pool 4D 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	140	0.183006536	-2.450032921	-0.448372038
D. ornatissima	2	0.002614379	-8.579315938	-0.022429584
E. crus-galli	4	0.005228758	-7.579315938	-0.03963041
G. ebracteata	3	0.003921569	-7.994353437	-0.031350406
H. gussoneanum	312	0.407843137	-1.293913719	-0.52771383
P. stipitatus	294	0.384313725	-1.379643593	-0.530215969
P. brevissimus	10	0.013071895	-6.257387843	-0.08179592
sum	765			
				-1.681508157
				H=1.68

4/14/95 Diversity

Pool 4E 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	6	0.004255319	-7.876516947	-0.033517093
H. gussoneanum	352	0.24964539	-2.002047829	-0.499802011
P. stipitatus	1048	0.743262411	-0.428056446	-0.318158266
P. brevissimus	4	0.002836879	-8.461479447	-0.024004197
sum	1410			
				-0.875481568
				H= 0.87
Pool 4F 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum				
				H=0
Pool 4G 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
A. heterophylla	16	0.225352113	-2.14974712	-0.484450055
B. hordeaceous	4	0.056338028	-4.14974712	-0.23378857
C. aquatica	20	0.281690141	-1.827819025	-0.514878598
C. exserta	3	0.042253521	-4.564784619	-0.192878223
D. ornatissima	1	0.014084507	-6.14974712	-0.086616157
G. ebracteata	1	0.014084507	-6.14974712	-0.086616157
H. gussoneanum	26	0.366197183	-1.449307401	-0.530732288
sum	71			
				-2.129960048
				H=2.13

4/14/95 Diversity

Pool 4I 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	10	0.005339028	-7.549207089	-0.04030543
D. bicornuta	1	0.000533903	-10.87113518	-0.00580413
D. ornatissima	43	0.022957822	-5.44487043	-0.125002364
E. macrostachya	41	0.021890016	-5.51358318	-0.120692424
G. ebracteata	24	0.012813668	-6.286172684	-0.080548929
H. gussoneanum	527	0.281366791	-1.829476033	-0.514753801
P. stipitatus	1163	0.620928991	-0.687499803	-0.426888559
P. brevissimus	1	0.000533903	-10.87113518	-0.00580413
V. myuros	63	0.033635878	-4.893855261	-0.16460912
sum	1873			
				-1.484408887
				H=1.48

Pool 6 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
D. ornatissimsa	3	0.042253521	-4.564784619	-0.192878223
E. macrostachya	5	0.070422535	-3.827819025	-0.26956472
E. vaseyi	15	0.211267606	-2.242856524	-0.473842928
H. gussoneanum	41	0.577464789	-0.792195115	-0.457464785
P. stipitatus	6	0.084507042	-3.564784619	-0.301249404
P. brevissimus	1	0.014084507	-6.14974712	-0.086616157
sum	71			
				-1.781616217
				H=1.78

Pool 7 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
D. ornatissima	3	0.045454545	-4.459431619	-0.202701437
H. gussoneanum	63	0.954545455	-0.067114196	-0.064063551
sum	66			
				-0.266764988
				H=0.27

4/14/95 Diversity

Pool OL 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
flooded				
				H=0
Pool OR 4/14/95	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	64	0.25498008	-1.971543554	-0.502704332
E. vaseyi	4	0.015936255	-5.971543554	-0.095164041
H. gussoneanum	32	0.12749004	-2.971543554	-0.378842206
J. bufonius	87	0.346613546	-1.528600058	-0.529833486
P. stipitatus	51	0.203187251	-2.299118212	-0.467151509
P. brevissimus	13	0.051792829	-4.271103836	-0.221212549
sum	251			
				-2.194908124
				H=2.19

4/28/95 Diversity

Pool 1A 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	10	0.044843049	-4.478971805	-0.200850754
H. gussoneanum	210	0.941704036	-0.086654382	-0.081602781
P. stipitatus	2	0.00896861	-6.8008999	-0.060994618
P. brevissimus	1	0.004484305	-7.8008999	-0.034981614
sum	223			
				-0.235832367
				H=0.23

Pool 1B 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
D. bicornuta	171	0.19837587	-2.333691544	-0.462948091
D. ornatissima	5	0.005800464	-7.429615964	-0.04309522
E. macrostachya	3	0.003480278	-8.166581558	-0.028421978
H. gussoneanum	277	0.321345708	-1.637801893	-0.526300608
P. stipitatus	376	0.436194896	-1.196955207	-0.522105752
P. brevissimus	30	0.034802784	-4.844653463	-0.168607429
sum	862			
				-1.751479078
				H=1.75

Pool 2A 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	1168	0.89092296	-0.166627411	-0.148452186
P. stipitatus	142	0.108314264	-3.206704851	-0.347331876
P. brevissimus	1	0.000762777	-10.35645197	-0.007899658
sum	1311			
				-0.50368372
				H=0.50

4/28/95 Diversity

Pool 2B 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	143	0.115977291	-3.108085748	-0.360467366
D. bicornuta	31	0.02514193	-5.313760774	-0.133598203
G. ebracteata	2	0.00162206	-9.267957084	-0.015033183
H. gussoneanum	657	0.532846715	-0.908207524	-0.483935396
O. inaequalis	2	0.00162206	-9.267957084	-0.015033183
P. stipitatus	385	0.312246553	-1.679242449	-0.524337667
P. brevissimus	13	0.01054339	-6.567517366	-0.069243898
sum	1233			
				-1.601648894
				H=1.60
Pool 2C 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
D. bicornuta	154	0.118461538	-3.077509367	-0.364566494
G. ebracteata	37	0.028461538	-5.134842542	-0.146145519
H. gussoneanum	760	0.584615385	-0.7744403	-0.452749714
O. inaequalis	14	0.010769231	-6.536940986	-0.070397826
P. stipitatus	303	0.233076923	-2.101121924	-0.489723033
P. brevissimus	32	0.024615385	-5.344295908	-0.131551899
sum	1300			
				-1.655134485
				H=1.66
Pool 2D 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
E. cicutarium				
				H=0
Pool 2E 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
G. ebracteata	12	0.04270463	-4.54946382	-0.19428315
H. gussoneanum	178	0.63345196	-0.65869289	-0.4172503
P. stipitatus	43	0.15302491	-2.70816157	-0.41441618
P. brevissimus	48	0.17081851	-2.54946382	-0.4345956
sum	281			
				-1.46144523
				H=1.46

4/28/95 Diversity

Pool 3 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
B. rubens	32			
E. macrostachya	38			
E. cicutarium	26			
G. ebracteata	9			
H. gussoneanum	228			
H. leporinum	79			
O. inaequalis	4			
P. stipitatus	146			
P. brevissimus	4			
sum	566			
				-2.32526957
				H=2.32
Pool 4A 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
D. bicornuta	1			
H. gussoneanum	435			
M. tricolor	44			
O. pilosa	1			
P. stipitatus	717			
P. brevissimus	76			
sum	1274			
				-1.42259365
				H=1.42
Pool 4B 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
D. ornitissima	2	0.003241491	-8.269126679	-0.0268043
E. macrostachya	10	0.016207455	-5.947198584	-0.096388956
G. ebracteata	3	0.004862237	-7.684164178	-0.037362225
H. gussoneanum	142	0.230145867	-2.11937956	-0.487766446
O. pilosa	158	0.256077796	-1.965345931	-0.503281454
P. stipitatus	239	0.387358185	-1.368259871	-0.53000666
P. brevissimus	63	0.102106969	-3.291846756	-0.336120495
sum	617			
				-2.017730537
				H=2.02

4/28/95 Diversity

Pool 4C 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	646	0.940320233	-0.088775934	-0.083477807
O. pilosa	30	0.043668122	-4.517275693	-0.197260947
P. stipitatus	2	0.002911208	-8.424166289	-0.024524502
P. brevissimus	9	0.013100437	-6.254241287	-0.081933292
sum	687			
				-0.387196548
				H=0.39
Pool 4D 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	24	0.023233301	-5.427662038	-0.126102506
G. ebracteata	8	0.007744434	-7.012624539	-0.054308806
H. gussoneanum	361	0.34946757	-1.516769512	-0.530061756
P. stipitatus	573	0.554695063	-0.85023321	-0.471620164
P. brevissimus	63	0.060987415	-4.035344615	-0.246105238
vegetative grass	4	0.003872217	-8.012624539	-0.03102662
sum	1033			
				-1.459225089
				H=1.46
Pool 4E 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	1	0.000696864	-10.48683502	-0.007307899
H. gussoneanum	404	0.281533101	-1.828623539	-0.514818056
P. stipitatus	1024	0.71358885	-0.486835022	-0.347400043
P. brevissimus	6	0.004181185	-7.901872521	-0.033039188
sum	1435			
				-0.902565186
				H=0.90
Pool 4F 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum				
				H=0

4/28/95 Diversity

Pool 4G 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
A. heterophylla	4	0.048780488	-4.357552005	-0.212563512
E. macrostachya	1	0.012195122	-6.357552005	-0.077531122
G. ebracteata	1	0.012195122	-6.357552005	-0.077531122
H. gussoneanum	71	0.865853659	-0.207804885	-0.17992862
C. exerta	1	0.012195122	-6.357552005	-0.077531122
P. brevissimus	4	0.048780488	-4.357552005	-0.212563512
sum	82			
				-0.837649011
				H=0.84
Pool 41 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
D. bicornuta	18	0.010483401	-6.575749323	-0.068936219
D. ornatissima	6	0.003494467	-8.160711823	-0.028517339
E. macrostachya	32	0.018637158	-5.745674324	-0.107083039
G. ebracteata	6	0.003494467	-8.160711823	-0.028517339
H. gussoneanum	792	0.461269656	-1.116317704	-0.514923484
O. pilosa	31	0.018054747	-5.791478014	-0.104563668
P. stipitatus	828	0.482236459	-1.052187367	-0.50740311
P. brevissimus	4	0.002329645	-8.745674324	-0.020374314
sum	1717			
				-1.380318512
				H=1.38
Pool 6 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
E. vaseyi	9	0.28125	-1.830074999	-0.514708593
H. gussoneanum	20	0.625	-0.678071905	-0.423794941
P. stipitatus	3	0.09375	-3.415037499	-0.320159766
sum	32			
				-1.2586633
				H=1.26

4/28/95 Diversity

Pool 7 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	88	0.505747126	-0.983511877	-0.497408306
O. pilosa	86	0.494252874	-1.016678741	-0.502496389
sum	174			
				-0.999904695
				H=1.0
Pool OL 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
E. vaseyi	29	0.100694444	-3.311944006	-0.333494362
P. penicillata	2	0.006944444	-7.169925001	-0.049791146
P. stipitatus	66	0.229166667	-2.125530882	-0.487100827
P. brevissimus	181	0.628472222	-0.670079114	-0.42112611
vegetative grass	10	0.034722222	-4.847996907	-0.168333226
sum	288			
				-1.459845671
				H=1.46
Pool OR 4/28/95	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	118	0.36196319	-1.466085105	-0.530668842
E. vaseyi	21	0.064417178	-3.956410731	-0.254860814
H. gussoneanum	41	0.125766871	-2.99117615	-0.376190865
P. penicillata	16	0.049079755	-4.348728154	-0.213434511
P. stipitatus	20	0.061349693	-4.026800059	-0.247042948
P. brevissimus	110	0.337423313	-1.567368441	-0.528866652
sum	326			
				-2.151064632
				H=2.15

5/12/95 Diversity

Pool 1A 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
B. hordeaceous	10	0.052631579	-4.247927513	-0.223575132
E. cicutarium	5	0.026315789	-5.247927513	-0.138103356
H. gussoneanum	175	0.921052632	-0.118644496	-0.109277826
sum	190			
				-0.470956314
Pool 1B 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	600	0.617283951	-0.695993813	-0.429625811
P. stipitatus	372	0.382716049	-1.385653692	-0.530311907
sum	972			
				-0.959937718
Pool 2A 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
E. vaseyi	1	0.000997009	-9.970105891	-0.009940285
H. gussoneanum	1002	0.999002991	-0.001439097	-0.001437663
sum	1003			
				-0.011377948
				H=0.01
Pool 2B 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
D. bicornuta	6	0.056603774	-4.142957954	-0.234507054
E. cicutarium	1	0.009433962	-6.727920455	-0.063470948
H. gussoneanum	31	0.29245283	-1.773724144	-0.518730646
P. stipitatus	67	0.632075472	-0.661831264	-0.418327308
sum	105			
				-1.235035956
				H=1.23

5/12/95 Diversity

Pool 2C 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
D. bicornuta	53	0.304597701	-1.715023041	-0.522392076
D. ornatissima	8	0.045977011	-4.442943496	-0.204273264
E. vaseyi	3	0.017241379	-5.857980995	-0.100999672
G. ebracteata	2	0.011494253	-6.442943496	-0.074056822
O. inaequalis	23	0.132183908	-2.91938154	-0.385895261
P. stipitatus	59	0.33908046	-1.560300446	-0.529067393
P. brevissimus	26	0.149425287	-2.742503778	-0.409799415
sum	174			
				-2.226483903
				H=2.22
Pool 2D 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
dead vegetation				
				H=0
Pool 2E 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
D. ornatissima	2	0.006849315	-7.189824559	-0.049245374
E. macrostachya	8	0.02739726	-5.189824559	-0.142186974
E. vaseyi	3	0.010273973	-6.604862058	-0.067858172
H. gussoneanum	109	0.373287671	-1.421640234	-0.530680772
P. stipitatus	109	0.373287671	-1.421640234	-0.530680772
P. brevissimus	60	0.205479452	-2.282933963	-0.46909602
V. peregrina	1	0.003424658	-8.189824559	-0.028047344
sum	292			
				-1.817795429
				H=1.81

5/12/95 Diversity

Pool 3 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
D. ornatissima	1	0.00280112	-8.479780264	-0.023752886
E. macrostachya	106	0.296918768	-1.751859809	-0.520160055
H. gussoneanum	83	0.232492997	-2.104740833	-0.489337505
L. hyssopifolium	1	0.00280112	-8.479780264	-0.023752886
P. stipitatus	166	0.464985994	-1.104740833	-0.513689015
sum	357			
				-1.570692346
				H=1.57
Pool 4A 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	1176	0.999150382	-0.00122626	-0.001225218
L. hyssopifolium	1	0.000849618	-10.20089861	-0.008666864
sum	1177			
				-0.009892082
				H=0.0098
Pool 4B 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	237	0.630319149	-0.665845603	-0.419695234
O. pilosa	72	0.191489362	-2.38466385	-0.456637759
P. stipitatus	67	0.178191489	-2.488499661	-0.443429461
sum	376			
				-1.319762453
				H=1.31

5/12/95 Diversity

Pool 4C 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
G. ebracteata	2	0.006116208	-7.353146825	-0.044973375
H. gussoneanum	280	0.856269113	-0.223863809	-0.191687665
J. bufonius	4	0.012232416	-6.353146825	-0.077714334
L. hyssopifolium	4	0.012232416	-6.353146825	-0.077714334
O. pilosa	36	0.110091743	-3.183221824	-0.350446439
P. stipitatus	1	0.003058104	-8.353146825	-0.025544792
sum	327			
				-0.768080939
				H=0.77
Pool 4D 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	177			
				H=0
Pool 4E 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	223	0.234984194	-2.089364377	-0.490967604
L. hyssopifolium	1	0.001053741	-9.890264277	-0.010421775
P. stipitatus	725	0.763962065	-0.388427092	-0.296743564
sum	949			
				-0.798132942
				H=0.80
Pool 4F 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	dead			
				H=0
Pool 4G 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	dead			
				H=0

5/12/95 Diversity

Pool 4I 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
H. gussoneanum	1	0.111111111	-3.169925001	-0.352213889
L. hyssopifolium	7	0.777777778	-0.362570079	-0.281998951
P. monspeliensis	1	0.111111111	-3.169925001	-0.352213889
sum	9			
				-0.986426729
				H=0.98
Pool 6 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
E. vaseyi	19	0.791666667	-0.337034987	-0.266819365
H. gussoneanum	5	0.208333333	-2.263034406	-0.471465501
sum	24			
				-0.738284866
				H=0.74
Pool 7 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
flooded				
				H=0
Pool OL 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
D. bicornuta	14	0.028688525	-5.123382416	-0.146982282
E. vaseyi	47	0.096311475	-3.376148486	-0.325161842
H. gussoneanum	47	0.096311475	-3.376148486	-0.325161842
O. pilosa	7	0.014344262	-6.123382416	-0.087835404
P. stipitatus	268	0.549180328	-0.864648147	-0.474847753
P. brevissimus	105	0.215163934	-2.21649182	-0.476909101
sum	488			
				-1.836898223
				H=1.84

5/12/95 Diversity

Pool OR 5/12/95	Number	Pi	Log2Pi	PiLog2Pi
D. bicornuta	4	0.008639309	-6.854868383	-0.059221325
E. macrostachya	134	0.289416847	-1.788779193	-0.517702833
E. vaseyi	17	0.036717063	-4.767405542	-0.175045128
H. gussoneanum	27	0.058315335	-4.099980881	-0.239091758
L. hyssopifolium	7	0.01511879	-6.047513461	-0.091431089
M. tricolor	5	0.010799136	-6.532940288	-0.070550111
P. stipitatus	50	0.107991361	-3.211012193	-0.346761576
P. brevissimus	218	0.470842333	-1.086684058	-0.511656857
vegetative dicot	1	0.002159827	-8.854868383	-0.019124986
sum	463			
				-2.030585663
				H=2.03

4/6/96 Diversity

Pool 1A 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. crus-gali	2	0.066666667	-3.906890596	-0.260459373
P. stipitatus	27	0.9	-0.152003093	-0.136802784
P. brevissimus	1	0.033333333	-4.906890596	-0.16356302
sum	30			
				-0.560825177
				H=0.56
Pool 1B 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. macrostachya	8	0.018779343	-5.73470962	-0.107694077
G. ebracteata	1	0.002347418	-8.73470962	-0.020504013
P. stipitatus	289	0.678403756	-0.559783938	-0.379759526
P. brevissimus	128	0.300469484	-1.73470962	-0.521227304
sum	426			
				-1.02918492
				H=1.0
Pool 2A 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
B. diandrus	55	0.035900783	-4.799840868	-0.172318047
E. cicutarium	9	0.005874674	-7.41127558	-0.043538825
H. gussoneanum	1418	0.925587467	-0.111558765	-0.103257394
P. stipitatus	50	0.032637076	-4.937344392	-0.161140483
sum	1532			
				-0.480254749
				H=0.48
Pool 2B 4/6/96	Number	Pi	Log2Pi	PiLog2Pi
E. cicutarium	1	0.001302083	-9.584962501	-0.01248042
H. gussoneanum	100	0.130208333	-2.941106311	-0.382956551
P. stipitatus	630	0.8203125	-0.285754482	-0.234407974
P. brevissimus	37	0.048177083	-4.375509135	-0.210799268
sum	768			
				-0.840644213
				H=0.84